California High-Speed Train Project

TECHNICAL MEMORANDUM

Peer Review of CHSTP Unit Prices
TM 100.01

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Reviewed by:	*Signed document on file* Kent Riffey, Chief Engineer	22 Jun 2011 Date
Reviewed by:	*Signed document on file* Roelof Van Ark, Chief Executive Officer	12 Jul 2011 Date

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0	02 Feb 11	Initial Release, R0

Note: Signatures apply for the latest technical memorandum revision as noted above

Prepared by PB 100 YEARS

for the California High-Speed Rail Authority

TABLE OF CONTENTS

ABSTRACT

In October, 2010, the Authority requested that PMT undertakes a cursory review of the key unit prices (Unit Price Elements or UPEs) it developed by selected Regional Consultant (RC) teams to confirm general adequacy of the pricing methods and assumptions relative to the scope and scale of CHSTP.

The UPE categories listed below were determined to affect project costs the most and were chosen for the review in these packages:

- Aerial Structures (Viaducts and Bridges)
- Tunnels (Bored, Excavated and Cut & Cover)
- Depressed Section Structures
- Track and Maintenance Facilities

1.0 INTRODUCTION

1.1 PURPOSE OF TECHNICAL MEMORANDUM

The purpose of this technical memorandum is to provide the review of the key unit prices by selected Regional Consultant.

1.2 GENERAL INFORMATION

The reviews were organized to minimize any disruption to main project activities being undertaken by RC teams while ensuring that each UPE package is reviewed by at least two different RC teams. Peer review assignments are summarized below:

No.	UPE Review Package	RC Team
1	Aerial Structures	HNTB, AECOM
2	Tunnels	Hatch Mott, Parsons
3	Depressed Sections	HNTB, Parsons
4	Track and Maintenance Facilities	STV, AECOM

Reviews were largely completed by second week of December of 2010 with an exception of STV team which was not able to complete this peer review of UPEs due to budgetary constraints. Informal meeting and teleconference discussions were held between PMT and RC technical staff to go over comments and findings resulting from the reviews.

2.0 DEFINITION OF TECHNICAL TOPIC

None Applicable

3.0 ASSESSMENT / ANALYSIS

3.1 KEY FINDINGS

All of the major line items and a random sampling of the minor sub-items were reviewed against a database of similar items for various large construction projects throughout the United States and found to be appropriate for the San Francisco region. The detail unit price multiplier to calculate the bid unit price is appropriate and reflects the state of the current market.

3.1.1 Aerial Structures

1. The assumed substructure for the 1-track aerial structures appears to be the same as the substructure for the 2-track aerial structures. It appears the costs for 1-track aerial structures may be conservative.
2. The column size appears small for HSR stiffness requirement and would need to be upsized for Cooper E80 loading for shared use corridors. The impact to the quantities is relatively minor unless this impacts the assumed foundation.
3. Advise increasing the cap width to at least 2-feet greater than the column diameter as it appears a monolithic connection is assumed. The impact to the quantities is relatively minor.
4. It is noted in the general assumptions of the provided information that the UPE's do not reflect all construction items/activities that will ultimately be required as part of the final project. For example, the UPE's for aerial structures are based on simple span precast segmental box girders for all superstructures. Cast-in-place construction may be

appropriate in certain situations such as for variable width structures at sections approaching stations and for longer continuous spans.

3.1.2 Tunnels

1. Plant and equipment hourly rates used in the estimates are somewhat low.
2. Recommend adding a Plant & Equipment purchase / salvage / assembly spreadsheet for all major equipment and plants.
3. Travel time within the tunnels from the dry house to the heading and back should be added, a union requirement.
4. Should add cost for major maintenance days or shifts at least once each week.
5. Should adjust the pay hours and rates to reflect the travel time and working through lunch, all that time is overtime.
6. For the road-header work, we believe these costs are very similar to that of drill and blast, and that attempting to differentiate between the two implies a level of accuracy higher than actual.
7. Many of the Sequentially Excavated Method (SEM) configurations reflect individual drifts are too small for support required to be installed.

3.1.3 Depressed Section Structures

1. The material used for general embankment and backfilling are assumed to be available from excavated on-site soils. Costs for hauling and disposal will be impacted by this assumption.
2. The retaining walls quantities appear to assume the use of a spread footing for all heights. For heights greater than 16', it would be more appropriate (conservative) to assume pile foundations.
3. The costs for 30-foot deep retained cut are greater than staged 40-foot deep retained cut. This does not appear to be correct.
4. The trench quantities do not appear to include provisions to resist buoyant forces. The provisions could include providing additional dead load or tension anchors. This could significantly impact the cost.
5. The maximum trench depth assumed is 60-feet. Recommend considering deeper trench sections to account for fluctuations in ground elevation that may not be offset or accommodated by modifying the rail profile or re-grading of the surface.

3.1.4 Track and Maintenance Facilities

No specific comments were received.

3.2 CORRECTIVE ACTIONS

3.2.1 Aerial and Depressed Trench Structures

The following adjustments in composition and basic assumptions of aerial and depressed trench structures UPEs have been made in response to the peer review comments:

1. Cost for an average 10-mile haul distance has been added to all earthmoving UPEs.
2. Cost of pile foundations have been reflected in the cost of taller retaining walls UPEs.
3. Revised UPEs for staged 4-track retained cut section.
4. Retained cut UPEs have been revised to include bulkhead with water stop costs.
5. Increase average assumption for steel reinforcement (pounds of steel per cubic yard of concrete) to reflect more realistic structural configuration.

Table below provides a comparative view of changes in unit costs as a result of these adjustments:

ITEM DESCRIPTION	ORIGINAL UNIT PRICE	REVISED UNIT PRICE	INCREASE OR DECREASE
At-Grade Track-bed in Cut - 1 Track (5' Avg. Exc Depth)	357	418	17%
At-Grade Track-bed in Cut - 1 Track (10' Avg. Exc Depth)	529	662	25%
At-Grade Track-bed in Cut - 2 Track (5' Avg. Exc Depth)	475	550	16%
At-Grade Track-bed in Cut - 2 Track (10' Avg. Exc Depth)	680	843	24%
At-Grade Track-bed in Cut - 2 Track (20' Avg. Exc Depth)	1,212	1,606	32%
At-Grade Track-bed in Cut - 2 Track (40' Avg. Exc Depth)	2,772	3,855	39%
At-Grade Track-bed in Cut - 2 Track (60' Avg. Exc Depth)	5,022	7,113	42%
At-Grade Track-bed in Fill - 2 Track (20' Avg. Fill Ht)	681	979	44%
At-Grade Track-bed in Fill - 2 Track (60' Avg. Fill Ht)	2,595	4,439	71%
Cut & Cover Box - 2 Track / 1 Box (40' Avg. Exc Depth)	34,961	30,737	-12%
Cut & Cover Box - 2 Track/ 2 Box (40' Avg. Exc Depth)	50,475	41,150	-18%
Retained Cut, Trench - 1 Track (10' Avg. Exc Depth)	6,119	5,623	-8%
Retained Cut, Trench - 2 Track (10' Avg. Exc Depth)	8,284	8,143	-2%
Retained Cut, Trench - 2 Track (20' Avg. Exc Depth)	20,496	19,900	-3%
Retained Cut, Staged Trench - 4 Track (40' Avg. Exc Depth)	41,935	64,301	53%
Retained Cut, Staged Trench - 4 Track (60' Avg. Exc Depth)	51,364	77,577	51%
Retained Fill, Walls Both Sides - 1 Tracks (20' Avg. Wall Ht)	2,999	5,432	81%
Retained Fill, Walls Both Sides - 2 Tracks (20' Avg. Wall Ht)	3,147	5,642	79%
Retained Fill, Walls Both Sides - 4 Tracks (20' Avg. Wall Ht)	3,338	5,696	71%

It should be noted that although increases in unit costs of retained trenches and retained fills appear to be quite substantial, the overall quantities of these elements are relatively small minimizing actual impact of this unit price increase on the total construction costs.

3.2.2 Tunnels

In the response of the peer review comments and follow up discussions with the reviewers, the following changes have been made consistently to all tunneling UPEs:

1. Standardizing the hourly and staff crew so similar labor positions are carried in the same cost categories over all the UPEs.
2. Applying basic manpower leveling principals across the production crews to better account for the labor costs. To aid in the development of the manpower leveling, basic schedules are being developed for each UPE to verify the crew durations.
3. Standardizing the location of the surface support equipment and personnel in each of the UPEs and using the schedules to verify the durations.
4. Additional labor costs for travel time, shift differential, and work thru lunch are being accounted for by using the overtime premium override for each schedule attached to crews.
5. Saturday maintenance shifts are being added to the estimates as needed.
6. The linear plant required to excavate the tunnels will be consistently added to all UPEs.

7. A stand alone equipment sheet will be created for each UPEs to verify that the sufficient equipment rental / ownership costs are accounted for.
8. Indirect costs and markups included in the UPEs will be added to each individual estimate instead of being applied as a percentage by excavation class.

Table below provides a comparative view of changes in tunneling unit costs as a result of these adjustments:

ITEM DESCRIPTION	ORIGINAL UNIT PRICE	REVISED UNIT PRICE	INCREASE OR DECREASE
TBM Single Track Twin Tunnel 30ft ID Unpressurized TBM in hard rock	23000	24000	4.3%
TBM Single Track Twin Tunnel 30ft ID Slurry TBM in hard rock	34000	33500	-1.5%
TBM Single Track Twin Tunnel 30ft ID Unpressurized TBM in hard rock (pre-cast liners) – new item	NA	29500	NA

4.0 SUMMARY AND RECOMMENDATIONS

4.1 CONCLUSION

Draft 15% level design UPEs are being reevaluated by the PMT in order to address comments and observations resulting from the peer review by selected RC teams. Recommended adjustments are being implemented while considering the preliminary nature of current design level.

Once updated, the prototypical UPEs will be distributed to the RC teams seeking further review for any adjustments or additions to the prototypical UPEs that that may be necessary in order to reflect site-specific conditions that may exist on each particular segment. These site specific adjustments will be concurred by both the PMT and RC teams.

5.0 SOURCE INFORMATION AND REFERENCES

None Applicable

6.0 DESIGN MANUAL CRITERIA

None Applicable

ATTACHMENT 1

Comments from HNTB Team

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Engineers Architects Planners

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Date
11/29/10

To
Dominic Spaethling

From
Tim Cobb

PROJECT
CORRESPONDENCE

Subject
California High-Speed Train Project
Peer Review of Unit Price Elements
Packages 2 and 3

INTRODUCTION

HNTB has been tasked to perform a Peer Review of the Unit Price Elements (UPE's) for the following two packages:

Package 2 – Aerial Structures

Unit Price Estimates – Aerial Structures, Draft Engineering Report dated October 2010

Cost Elements Spreadsheet - PROTOTYPICAL UPEs (REV2). XLSX

Unit Price Report – pdf file Unit Price Detail_10-01-10

Package 3 – Walls and Trenches

Unit Price Estimates – Walls and Trenches, Draft Engineering Report dated October 2010

Cost Elements Spreadsheet - PROTOTYPICAL UPEs (REV2). XLSX

Unit Price Report – pdf file Unit Price Detail_10-01-10

As part of the peer review process, HNTB has performed a cursory review of the prototypical structural systems assumed for the development of the conceptual level costs for the UPE's. A cursory review of the costs was also performed. This memo presents the findings of our review.

FINDINGS

Based on our cursory review of the information provided in Packages 2 and 3, the assumed prototypical structural systems appear appropriate for the development of the conceptual level costs for the UPE's considered. A cursory review of the costs was performed and, in general, they are appropriate for "generic" unit prices. We offer the following observations for consideration:

Package 2 – Aerial Structures

Structure Design

1. The assumed substructure for the 1-track aerial structures appears to be the same as the substructure for the 2-track aerial structures. It appears the costs for 1-track aerial structures may be conservative.

2. The assumed column sizes are shown on TYPICAL COLUMN CROSS SECTIONS, Drawing TTM 1.1.21-0. The smallest column size noted is 6'x8'. The column size appears small for HSR stiffness requirement and would need to be upsized for Cooper E80 loading for shared use corridors. The impact to the quantities is relatively minor unless this impacts the assumed foundation.
3. The assumed foundation type and sizes are shown on TYPICAL COLUMN CROSS SECTIONS, Drawing TTM 1.1.21-0. The footing dimensions and the number, size and length of piles are grouped based on column heights of less than 30-feet, 30 to 50-feet, and 50 to 90-feet. As the foundation cost appears to be a significant portion of the total structure cost, the resulting cost is effectively a "step function" based on the three groupings of column height as demonstrated by the costs for the UPE's. For example, for a 2-track aerial structure the cost difference between a column height of 20 and 30-feet is 22% while the cost difference between a column height of 30 and 50-feet is only 4%.
4. The assumed pile type is a drilled shaft, uncased in soft rock. It is uncertain from the information provided if the foundation costs are sensitive to the assumed pile type.
5. The assumed bent cap dimensions for straddle bents are shown on STRADDLE BENT OVER 2 RR TRACKS, Drawing MISC-007 TTM 1.1.21-0 and STRADDLE BENT OVER 4 RR TRACKS, Drawing MISC-008. We advise increasing the cap width to at least 2-feet greater than the column diameter as it appears a monolithic connection is assumed. The impact to the quantities is relatively minor.
6. It is noted in the general assumptions of the provided information that the UPE's do not reflect all construction items/activities that will ultimately be required as part of the final project. For example, the UPE's for aerial structures are based on simple span precast segmental box girders for all superstructures. Cast-in-place construction may be appropriate in certain situations such as for variable width structures at sections approaching stations and for longer continuous spans.

Package 3 – Walls and Trenches

Structure Design

1. It is noted in the general assumptions of the provided information that the material used for general embankment and backfilling are assumed to be available from excavated on-site soils. Costs for hauling and disposal will be impacted by this assumption.
2. The retaining walls quantities appear to assume the use of a spread footing for all heights. For heights greater than 16', it would be more appropriate/conservative to assume pile foundations.
3. The costs for Retained Cut, Trench - 4 Track (30' Avg. Exc. Depth) are greater than Retained Cut, Staged Trench - 4 Track (40' Avg. Exc. Depth). This does not appear to be correct.
4. The Retained Cut, Trench – 4 Track quantities do not appear to include waterproofing.
5. The calculations provided for the trench wall thicknesses assume ground water at 5-feet below the ground surface. The trench quantities do not appear to include provisions to resist buoyant forces. The provisions could include providing additional dead load or tension anchors. This could significantly impact the cost.

6. For long sections of trench, it is not clear how the street and drainage crossings over the trench are accounted for.
7. The maximum trench depth assumed is 60-feet. Recommend considering deeper trench sections in the UPE's to account for fluctuations in ground elevation that may not be offset or accommodated by modifying the rail profile or re-grading of the surface.

Cost Estimate

1. All of the major line items and a random sampling of the minor sub-items were reviewed against a database of similar items for various large construction projects throughout the United States. In general, the cost data is appropriate for the San Francisco region.
2. The detail unit price multiplier to calculate the bid unit price is appropriate and reflects the state of the current market.
3. Our recommendations for formatting changes for clarity are as follows:
    a. Embed the header in the worksheet (similar to FTA SCC Worksheet)
    b. Include the location (SF or LA) and the date these numbers are referring to (i.e. 2010) in the header of each worksheet.
    c. Add a location code to each sub-category so that it is clear which location the cost number is for.
    d. Rename the worksheets in the workbook so that it is clear what location and item they are for.
    e. Clearly delineate either direct unit cost or bid unit cost. Some of the spreadsheets say only unit cost and it is unclear which one they are referring to.

ATTACHMENT 2

Comments from Parsons Team

PARSONS

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MEMO TO: CHST PMT

FROM: Dave Wemmer, Colman Mullin, Arthur Pazdan

DATE: December 2nd, 2010

SUBJECT: CHST - Peer Review of Unit Prices for Trench, Wall, and Tunnel costs

We have reviewed the prototypical unit prices provided by PMT on October 27th, 2010. Our review was conducted within the limitations of TM 1.1.19 *Capital Cost Estimating Methodology for the 15% Design Level* and the assumptions listed in the reference materials provided by PMT. For example, no structural design was provided in the draft *Unit Price Estimates for Walls and Trenches* (October 2010), so any quantity takeoff backup provided for a line item unit price had to be taken at face value as accurate. This complicated our ability to review costs for the Unit Price Elements (UPE), as we could not adequately validate any UPE scope, schedule or method. Therefore, only pricing was considered, and not validity of work item scope, schedule or method.

Unit prices were provided by PMT for the twenty-one (21) UPE's under *C-3 Structures – Walls* and forty-five (45) UPE's under *Tunneling*. The unit prices are not un-reasonable for several of the UPE's where we could properly assess scope, schedule or method. Attached in Appendix A you will find a report of expected price ranges for the work as defined by the PMT. Due to the undefined or unfinished nature of some UPE's, however, we were unable to determine a confidence level for the potential variance in cost all of the UPE's. Also, several UPE's used the same unit cost for sub-items despite orders of magnitude difference in quantity between UPE's. Please consider our attached detailed study of the subject UPE's, along with recommendations for which sub-items of work should be better defined in order to validate the unit prices with any acceptable level of confidence.

Several dozen UPE's were provided for trenches and walls, yet there are in reality only two or three construction methods being considered. At the 15% design level as identified by the PMT, there are essentially two options being considered for retained cut trench construction. For shallow trenches (less than 30' depth) a soldier pile wall is proposed with temporary lagging and permanent concrete walls. For deep trenches (greater than 30' depth) a slurry wall is proposed. Other retained cut trench construction methods should be considered by the PMT to give greater flexibility to the Regional Consultants for 15% design and cost development. Similarly, only one method, cast-in-place concrete walls are proposed for retained fill sections. Again, more cost-effective retained fill construction methods like MSE walls should be considered by the PMT.

Understandably, the 15% design level is meant to study alignment alternatives, and not to value engineer any one alignment. The desire to keep a simple uniform approach to program corridor design should be balanced with a more robust selection of trench, wall and tunnel work item alternatives. A more balanced design approach will provide the Authority with a better value design and more appealing bid environment for whatever project delivery method is chosen. We encourage the PMT to consider our concerns with the development of prototypical UPE's.

Appendix A: Unit Price Review

Trenches, Walls, and Cut & Cover Tunnels

GENERAL COMMENTS AND ISSUES OF CONCERN:

- Parsons used the items listed, quantities and descriptions as given.
- Pricing includes use of contaminated material generated on site for construction – this is material generated on site with fixed contamination. Examples include asphalt millings, native serpentine (asbestos), cinnabar (mercury), etc.
- Excavation Support – 60 foot depth excavation (all widths) with a equivalent of a single 6" strut every 500 square feet. Observed 50 foot wide with depth varying from 30 feet to 70 feet had
- Maintenance and protection of traffic – this can significantly increase the price of project
- Maintenance and protection of utilities – utility relocations are covered in another unit price, however maintenance of utilities, including support/protection of large parallel utilities and almost all perpendicular utilities is not addressed.
- Conditions imposed for construction:
    - Conditions imposed on easements by railroads, CALTRANS, utility owners, and other governmental bodies
    - Conditions imposed by authorities having jurisdiction
    - Commitments made as part of environmental process
    - Requirements of governmental bodies having precedence (federal, state, etc.)
- Reinforcing steel – estimate has as little as 50 lb/yd3. The lowest observed in any CALTRANS structure is 187 lb/yd3 and for large moment structures is usually well over 200 lb/yd3. Some structures exceeded 1,000 lb/yd3.
- Fixed Price – Certain items (primarily allowances) have insufficient information to evaluate. Parsons incorporated the fixed price value below the line due to our inability to evaluate.
- Certain items were left un-priced since there was insufficient information to identify scope of listed items.

DOCUMENTS FURNISHED:

The following documents were furnished via e-mail (chronological order):

- Package3-Walls.zip
    - Binder3.pdf
    - PrototypicalUPEs(REV2).xlsx
    - Unit Price Detail_10_01_10.pdf
- Appendix 1 _ CAHSPR Conceptual Unit Costs.pdf
- Package 1 – Tunnels.zip
    - 2010ProgrammaticUnitCosts(REV3).xlsx
    - Binder1.pdf
    - Unit Price Detail_10_01_10.pdf
- Tunnel Unit Cost Reports.zip:
    - IndirectCostReport UCC01.pdf
    - IndirectCostReport UCC05r1.pdf
    - IndirectCostReportUCC17r1.pdf
    - IndirectCostReportUCC29r1.pdf
    - UCC01costreport.pdf
    - UCC02costreport.pdf
    - UCC03costreport.pdf
    - UCC04Bcostreport.pdf (sub B)
    - UCC04costreport.pdf
    - UCC05costreport.pdf (no 6 or 7)
    - UCC08costreport.pdf
    - UCC09costreport.pdf (no 10 or 11)
    - UCC12costreport.pdf
    - UCC13costreport.pdf (no 14 or 15)
    - UCC16costreport.pdf
    - UCC17costreport.pdf (no 18 or 19)

- UCC20costreport.pdf
- UCC21costreport.pdf (no 22 or 23)
- UCC24costreport.pdf
- UCC25costreport.pdf (no 26 or 27)
- UCC28costreport.pdf
- UCC29costreport.pdf (no 30 or 31)
- UCC32costreport.pdf
- UCC33costreport.pdf (no 34 or 35)
- UCC36costreport.pdf
- UCC37costreport.pdf (no 38 or 39)
- UCC40costreport.pdf
- UCC41costreport.pdf (no 42)
- UCC43costreport.pdf
- UCC44costreport.pdf
- UCC45costreport.pdf

Unit Price Elements analyzed (37 UPE):

This portion of review covers:

- Trench Structures / Retaining walls
- Cut and cover tunnels
- Support elements for the above items

Mined tunnels are covered in another analysis (see Appendix B).

Cut & Cover Pricing (12 UPE):

10.06.114 - Cut & Cover Box - 1 Track/ 1 Box (40' Avg. Exc Depth)
10.06.115 - Cut & Cover Box - 1 Track/ 1 Box (50' Avg. Exc Depth)
10.06.116 - Cut & Cover Box - 1 Track/ 1 Box (60' Avg. Exc Depth)
10.06.214 - Cut & Cover Box - 2 Track / 1 Box (40' Avg. Exc Depth)
10.06.215 - Cut & Cover Box - 2 Track / 1 Box (50' Avg. Exc Depth)
10.06.216 - Cut & Cover Box - 2 Track / 1 Box (60' Avg. Exc Depth)
10.06.224 - Cut & Cover Box - 2 Track/ 2 Box (40' Avg. Exc Depth)
10.06.225 - Cut & Cover Box - 2 Track / 2 Box (50' Avg. Exc Depth)
10.06.226 - Cut & Cover Box - 2 Track / 2 Box (60' Avg. Exc Depth)
10.06.414 - Cut & Cover Box - 4 Track / 1 Box (40' Avg. Exc Depth)
10.06.415 - Cut & Cover Box - 4 Track / 1 Box (50' Avg. Exc Depth)
10.06.416 - Cut & Cover Box - 4 Track / 1 Box (60' Avg. Exc Depth)
10.06.922 - Double Deck - 2 Track Trench on Top of 2 Track C&C Box

U-Wall Segments (17 UPE):

10.08.211 - Retained Cut, Trench - 1 Track (10' Avg. Exc Depth)
10.08.212 - Retained Cut, Trench - 1 Track (20' Avg. Exc Depth)
10.08.213 - Retained Cut, Trench - 1 Track (30' Avg. Exc Depth)
10.08.221 - Retained Cut, Trench - 2 Track (10' Avg. Exc Depth)
10.08.222 - Retained Cut, Trench - 2 Track (20' Avg. Exc Depth)
10.08.223 - Retained Cut, Trench - 2 Track (30' Avg. Exc Depth)
10.08.241 - Retained Cut, Trench - 4 Track (10' Avg. Exc Depth)
10.08.242 - Retained Cut, Trench - 4 Track (20' Avg. Exc Depth)
10.08.243 - Retained Cut, Trench - 4 Track (30' Avg. Exc Depth)
10.08.344 - Retained Cut, Staged Trench - 4 Track (40' Avg. Exc Depth)
10.08.346 - Retained Cut, Staged Trench - 4 Track (60' Avg. Exc Depth)
10.08.411 - Retained Fill, Walls Both Sides - 1 Tracks (10' Avg. Wall Ht)
10.08.412 - Retained Fill, Walls Both Sides - 1 Tracks (20' Avg. Wall Ht)
10.08.413 - Retained Fill, Walls Both Sides - 1 Tracks (30' Avg. Wall Ht)
10.08.421 - Retained Fill, Walls Both Sides - 2 Tracks (10' Avg. Wall Ht)
10.08.422 - Retained Fill, Walls Both Sides - 2 Tracks (20' Avg. Wall Ht)
10.08.423 - Retained Fill, Walls Both Sides - 2 Tracks (30' Avg. Wall Ht)

C+C Tunnel and U-Wall support elements (8 UPE):
10.07.801 - Ventilation Shaft
10.07.802 - Mid-Line Ventilation Structure
10.07.803 - Tunnel Portal Structure
10.07.805 - Emergency Access Shaft
10.07.850 - Pumping Station
10.07.901 - Mechanical & Electrical Allowance for Underground (Single)
10.07.902 - Mechanical & Electrical Allowance for Underground (Double)
10.07.920 - Ventilation Equipment Allowance
10.07.950 - Allowance for Construction Monitoring

METHODOLOGY:

Assumption: 80% of the cost is a small % of the items – candidate for Pareto analysis

Technique:

A review is usually done in several parts:
- Arithmetic check
- Scope review
- Quantity review
- Pricing review0

Approach – identification of target UPEs for review:

Due to time constraints for this review, only certain items could be reviewed the following approach was used:
1. Extract cost details of each UPE
2. Sort the details of each UPE by Bid Total (decreasing)
3. Identify % of individual UPE Bid Total attributed to each line
4. Do a cumulative sum of %'s starting with the largest
5. Identify which items comprise 80% of UPE cost – these are the cost drivers
6. Make a list of the cost drivers
7. Extract and count the number of times each cost driver occurs
8. Perform review on the most common cost drivers (see list below)
9. Review all elements to see if scope issues are part of another UPE
10. Review list for unexpected cost drivers – Items normally not in top costs

Actions during on review:
A review is usually done in several parts:
- Arithmetic check – This check is only sampling for assurance that arithmetic is correct. Estimate sheets furnished appear to have been prepared using a database type software. As software typically uses the same algorithm a sampling of line items was done on 8 items involving 3 UPEs. Calculations and extensions appear to be correct and applied properly
  - Quantity X rate
  - Labor hours X wage rate
  - Line sum total
  - Summary of line items for UPE
  - UPE back calculation to unit price.
- Scope review – This is the primary area of review. We reviewed to the extent possible for completeness of title scope and looked for other items which may contain associated scope for UPE (example: Utility relocation with U-Wall and Cut & Cover Tunnel. Gaps in scope were noted. Please see description of the approach and comments.
- Quantity review – As the documents are schematic in nature we are unable to validate that quantities are correct.
- Pricing review – Due to the issues on scope and quantities we are not able to determine if unit rates are appropriate or reasonable.

Major cost line items (covering 80%+ of cost):

5 most common (major cost driver in 75% of all UPE):

- Reinforcing Steel
- Soldier Pile & Lagging
- Structural Concrete, In Place, Walls, Formed 1 Side
- Structural Concrete, In Place, Slab on Grade
- Structural Concrete, In Place, Elevated Slab

Unexpected major cost items:

- 6 ft. Chain Link Fence, Wall Mounted
- Architectural Finish Allowance, Non-Public Space
- Track-way Drainage Allowance, Ballasted

Rank	Description	Count
1	Reinforcing Steel	30
2	Structural Concrete, In Place, Walls, Formed 1 Side	28
3	Soldier Pile & Lagging	25
4	Structural Concrete, In Place, Slab on Grade	23
5	Structural Concrete, In Place, Elevated Slab	14
6	Structural Excavation	12
7	Structural Concrete, In Place, Footing	6
8	Sheet Waterproofing	4
9	Electrical Allowance, Misc. Structure	3
10	Architectural Finishes Allowance, Non-Public Space	2
11	Fire Protection Allowance, Tunnel	2
12	Slurry Wall	2
13	Structural Concrete, In Place, Beams & Girders	2
14	Ventilation Allowance, Tunnel	2
15	6 ft. Chain Link Fence, Wall Mounted	1
16	Cable Duct, At-Grade Guideway	1
18	Embankment w/Haul & Compaction	1
20	Haul and Dispose of Excavated Material	1
21	Mechanical Allowance, Misc. Structure	1
22	Track-way Drainage Allowance, Ballasted	1
23	Ventilation Building Louver/Screen Allowance	1
	Occurrences	162
	UPE Evaluated	37

Line item analysis of each element:

General issues associated with unit pricing:

- No actual design information for verification of quantities or scope
- No maintenance of traffic
- No protection of utilities in place parallel or perpendicular (relocations priced elsewhere)
- Depth of the U-wall / tunnel is normally referenced with top of rail or top of slab
- Statewide pricing
- All labor markets
- All jurisdictions
- Which is applicable wage adjustment?
  - Federal (Davis-Bacon)
  - California (Dept. of Industrial Relations)
- Pay adjustments for insurances and taxes
- Adjustments for work week and possible work hour limitations

Soldier Pile & Lagging

Undefined in Scope
Quantity based on exposed face not full height of soldier piles
No information on embedment beyond face
Removal of soldier piles and lagging
Same unit price for all depths
NOTE: Tunnel depth varies
Tie back information
Bracing steel quantity =~ 6" standard weight tube steel every 525 sf of face
Shear resistance
Dealing with any bracing, whalers, or shear resistance in construction of walls and slabs and roof
Why is soldier pile and lagging used over slurry wall?

Observations:
Same price at all depths
Same price at all widths

Reinforcing Steel

Undefined in Scope:
- Rebar accessories
- Rebar welding
- Rebar bonding / grounding (there is an allowance for corrosion control)
- Rebar splices
- Dowelling between segments
- Coating
- NDE
- Inspection
- Testing
- Dental concrete (equipment pads, pedestals, block outs
- Area adjustments
- Wage adjustment for Federal (Davis-Bacon) or CA (Dept. of Industrial Relations)
- Total pay adjustments for insurances or taxes

Observations:
Same price at all depths
Same price at all widths
All soil types (there is an allowance for corrosion control)
Adequacy of amount of reinforcing steel is not addressed
All cut & cover prices have ~150 lb/cy
All U-Wall segments
- ~150 lb/cy for Retained cut
- ~60 lb/cy for Retained fill

In other tunnel structures:
- 200 lb/cy for Ventilation shaft & mid-line, portal structure, and emergency access shaft
- 150 lb/cy for pumping station

Slab on Grade (both Cut & Cover and U-walls:

Undefined in Scope:
No adjustment for seismic loading or uplift
No adjustment for buoyancy
Form accessories
Miscellaneous metal
Bracing & work around internal bracing
Joint cleaning

Bulkhead formwork
Preparation for 2nd pour (track concrete)
Water-stop
Admixtures
Curing & Sealing compounds
Cooling during curing (up to 6' thick)
Grouting
Mud slab (working slab at bottom)
Dental concrete (equipment pads, pedestals, block outs
Hydrostatic loading (dewatering allowance in construction items)

Observations:
Same price at all depths
Same price at all widths
Thickness only varies by depth, not width
It is not clear soldier piles and lagging are removed
Provisions for embedded utilities
- Allowance for Cable Duct
- Allowance for Dewatering (during construction?)

Exterior walls – forming one side (both Cut & Cover and U-walls)

Undefined in Scope:
- Adjustment for seismic loading or uplift
- Removal of soldier piles and lagging
- Form accessories
- Provisions for embedded utilities
- Miscellaneous metal
- Form bracing
- Bracing & work around internal bracing
- Joint cleaning
- Preparation for 2nd pour (track concrete)
- Water-stop
- Admixtures
- Sealing compounds
- Cooling
- Grouting
- Mud slab
- Dental concrete (equipment pads, pedestals, block outs

Observations:
- Same price at all depths
- Same price at all widths
- Sketch shows 31' between bottom slab (top) and underside of roof – may be more than 1 lift.
- Thickness only varies by depth, not width
- Provisions for embedded utilities
    - Allowance for Cable Duct
    - Allowance for Dewatering (during construction?)
- Adjustment to thickness for depth but no adjustment for span

Roof Slab (Cut & Cover only)

Undefined in Scope:
- Same thickness for all spans (1 track & 2 track), Thickness normally varies with depth
- No adjustment for seismic loading or uplift
- Credit for use of shoring system for bottom of deck form support
- Provisions for embedded utilities
- Form accessories

- Miscellaneous metal
- Bracing & work around internal bracing
- Joint cleaning
- Preparation for 2nd pour (track concrete)
- Water-stop
- Admixtures
- Sealing compounds
- Cooling during curing (up to 4'+ thick)
- Grouting
- Mud slab
- Dental concrete (equipment pads, pedestals, block outs

Observations:
- Same price at all depths
- Same price at all widths.

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.114		CC	Cut & Cover Box - 1 Track/ 1 Box (40' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	2,118.000	lb	1.30	2,754	3,485	1.65		P	CC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,271	$ 12,030
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	3.730	cy	320.03	1,194	1,505	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 933	$ 4,304
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	6.670	cy	395.18	2,636	3,324	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 1,534	$ 4,682
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	3.730	cy	546.16	2,037	2,569	688.65		P	CC-Det		$ 440.00	$ 2,200.00	$ 1,641	$ 8,206
	05-53-16.50	A010	Service/Safety Walkway	1.000	lf	45.48	45	57	57.10		P	CC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	07-13-53.10	A010	Sheet Waterproofing	132.000	sf	6.19	817	1,027	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 535	$ 2,397
	07-17-13.10	A010	Composite Drainage Board	74.000	sf	2.08	154	192	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 296	$ 1,258
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	3.190	sy	5.54	18	23	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 1	$ 19
	31-23-16.16	A010	Structural Excavation	44.720	cy	21.83	976	1,250	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 179	$ 8,273
	31-23-23.14	A010	Structrual Backfill	5.320	cy	17.17	91	117	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 53	$ 2,692
	31-52-16.10	A010	Soldier Pile & Lagging	80.000	sf	72.32	5,786	7,266	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 10,718	$ 27,822
	33-71-19.17	A060	Cable Duct, Underground Guideway	1.000	lf	41.74	42	52	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	1.000	lf	27.19	27	34	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 9	$ 225
	31-23-23.20	A010	Haul and Dispose of Excavated Material	39.400	cy	12.96	511	628	15.94		P	CC-Det		$ 1.00	$ 110.00	$ 39	$ 4,334
	10-14-19.10	A050	Signage Allowance, Tunnels	1.000	lf	15.00	15	17	17.25		P	CC-Det		$ 2.25	$ 285.00	$ 2	$ 285
	32-06-10.10	A100	Site Restoration Allowance	3.750	sy	49.76	187	232	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 45	$ 896
	05-12-23.77	A010	Structural Steel (for Bracing)	0.090	ton	2,103.44	189	238	2,639.11		P	CC-Det	1.16 tn/lf	$ 600.00	$ 20,000.00	$ 54	$ 1,800
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.750	sy	0.49	2	2	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 7
			Cut & Cover Box - 1 Track/ 1 Box (40' Avg. Exc Depth)	1.000	RF		17,593	22,163			P	CC-Det			Subtotal	$ 18,634	$ 84,660
								$ 120,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 18,638	$ 84,665
															Per Mile	$ 100,000,000	$ 450,000,000
10.06.115		CC	Cut & Cover Box - 1 Track/ 1 Box (50' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	2,489.000	lb	1.30	3,236	4,096	1.65		P	CC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,493	$ 14,138
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	4.410	cy	320.03	1,411	1,779	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 1,103	$ 5,088
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	7.780	cy	395.18	3,075	3,877	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 1,789	$ 5,462
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	4.410	cy	546.16	2,409	3,037	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 1,940	$ 9,702
	05-53-16.50	A010	Service/Safety Walkway	1.000	lf	45.48	45	57	57.10		P	CC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	07-13-53.10	A010	Sheet Waterproofing	136.000	sf	6.19	842	1,059	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 551	$ 2,470
	07-17-13.10	A010	Composite Drainage Board	76.000	sf	2.08	158	197	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 304	$ 1,292
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	3.310	sy	5.54	18	23	7.08		P	CC-Det		$ 0.35	$ 6.00	$ 1	$ 20
	31-23-16.16	A010	Structural Excavation	55.090	cy	21.83	1,203	1,540	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 220	$ 10,192
	31-23-23.14	A010	Structrual Backfill	13.220	cy	17.17	227	291	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 132	$ 6,689
	31-52-16.10	A010	Soldier Pile & Lagging	100.000	sf	72.32	7,232	9,083	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 13,397	$ 34,778
	33-71-19.17	A060	Cable Duct, Underground Guideway	1.000	lf	41.74	42	52	52.26		P	CC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	1.000	lf	27.19	27	34	34.00		P	CC-Det		$ 9.00	$ 225.00	$ 9	$ 225
	31-23-23.20	A010	Haul and Dispose of Excavated Material	41.870	cy	12.96	543	667	15.94		P	CC-Det		$ 1.00	$ 110.00	$ 42	$ 4,606
	10-14-19.10	A050	Signage Allowance, Tunnels	1.000	lf	15.00	15	17	17.25		P	CC-Det		$ 2.25	$ 285.00	$ 2	$ 285
	32-06-10.10	A100	Site Restoration Allowance	3.860	sy	49.76	192	239	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 46	$ 922
	05-12-23.77	A010	Structural Steel (for Bracing)	0.140	ton	2,103.50	294	370	2,639.29		P	CC-Det		$ 600.00	$ 20,000.00	$ 84	$ 2,800
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.860	sy	0.50	2	2	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 7
			Cut & Cover Box - 1 Track/ 1 Box (50' Avg. Exc Depth)	1.000	RF		21,084	26,565			P	CC-Det			Subtotal	$ 22,439	$ 104,105
								$ 150,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 22,443	$ 104,109
															Per Mile	$ 120,000,000	$ 550,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.116		CC	Cut & Cover Box - 1 Track/ 1 Box (60' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	3,264.000	lb	1.30	4,244	5,371	1.65		P	CC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,958	$ 18,540
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	5.880	cy	320.03	1,882	2,372	403.38		P	CC-Det		$ 250.00	$ 1,153.85	$ 1,470	$ 6,785
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	10.000	cy	395.18	3,952	4,983	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 2,300	$ 7,020
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	5.880	cy	546.16	3,211	4,049	688.65		P	CC-Det		$ 440.00	$ 2,200.00	$ 2,587	$ 12,936
	05-53-16.50	A010	Service/Safety Walkway	1.000	lf	45.48	45	57	57.10		P	CC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	07-13-53.10	A010	Sheet Waterproofing	144.000	sf	6.19	891	1,121	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 583	$ 2,615
	07-17-13.10	A010	Composite Drainage Board	80.000	sf	2.08	166	207	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 320	$ 1,360
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	3.530	sy	5.54	20	25	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 1	$ 21
	31-23-16.16	A010	Structural Excavation	70.560	cy	21.83	1,541	1,972	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 282	$ 13,054
	31-23-23.14	A010	Structrual Backfill	23.520	cy	17.17	404	517	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 235	$ 11,901
	31-52-16.10	A010	Soldier Pile & Lagging	120.000	sf	72.32	8,679	10,899	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 16,076	$ 41,734
	33-71-19.17	A060	Cable Duct, Underground Guideway	1.000	lf	41.74	42	52	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	1.000	lf	27.19	27	34	34.03		P	CC-Det		$ 9.00	$ 225.00	$ 9	$ 225
	31-23-23.20	A010	Haul and Dispose of Excavated Material	47.040	cy	12.96	610	750	15.94		P	CC-Det		$ 1.00	$ 110.00	$ 47	$ 5,174
	10-14-19.10	A050	Signage Allowance, Tunnels	1.000	lf	15.00	15	17	17.25		P	CC-Det		$ 2.25	$ 285.00	$ 2	$ 285
	32-06-10.10	A100	Site Restoration Allowance	4.080	sy	49.77	203	253	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 49	$ 974
	05-12-23.77	A010	Structural Steel (for Bracing)	0.190	ton	2,103.40	400	501	2,639.26		P	CC-Det		$ 600.00	$ 20,000.00	$ 114	$ 3,800
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	4.080	sy	0.50	2	3	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 7
			Cut & Cover Box - 1 Track/ 1 Box (60' Avg. Exc Depth)	1.000	RF		26,446	33,329			P	CC-Det			Subtotal	$ 27,359	$ 131,861
								$ 180,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 27,363	$ 131,865
															Per Mile	$ 150,000,000	$ 700,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.214		CC	Cut & Cover Box - 2 Track / 1 Box (40' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	3,414.000	lb	1.30	4,439	5,618	1.65		P	CC-Det	216 lb/cy	$ 0.60	$ 5.68	$ 2,048	$ 19,392
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	6.940	cy	320.03	2,221	2,800	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 1,735	$ 8,008
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	6.670	cy	395.18	2,636	3,324	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 1,534	$ 4,682
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	2.220	cy	470.28	1,044	1,315	592.37		P	CC-Det		$ 230.00	$ 702.00	$ 511	$ 1,558
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	6.940	cy	546.16	3,790	4,779	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 3,054	$ 15,268
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	181.000	sf	6.19	1,120	1,409	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 733	$ 3,287
	07-17-13.10	A010	Composite Drainage Board	74.000	sf	2.08	154	192	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 296	$ 1,258
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	5.940	sy	5.54	33	42	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 36
	31-23-16.16	A010	Structural Excavation	83.220	cy	21.83	1,817	2,326	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 333	$ 15,396
	31-23-23.14	A010	Structrual Backfill	9.910	cy	17.17	170	218	21.97		P	CC-Det		$ 10.00	$ 506.00	$ 99	$ 5,014
	31-52-16.10	A010	Soldier Pile & Lagging	80.000	sf	72.32	5,786	7,266	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 10,718	$ 27,822
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.01		P	CC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	73.310	cy	12.96	950	1,168	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 165	$ 20,893
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det	333 ft/ea	$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	6.500	sy	49.77	323	403	61.96		P	CC-Det		$ 12.00	$ 238.80	$ 78	$ 1,552
	05-12-23.77	A010	Structural Steel (for Bracing)	0.230	ton	2,103.44	484	607	2,639.22		P	CC-Det		$ 600.00	$ 20,000.00	$ 138	$ 4,600
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	6.500	sy	0.49	3	4	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 12
			Cut & Cover Box - 2 Track / 1 Box (40' Avg. Exc Depth)	1.000	RF		25,351	31,948			P	CC-Det			Subtotal	$ 23,024	$ 136,247
								$ 170,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 23,028	$ 136,251
															Per Mile	$ 130,000,000	$ 720,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.215		CC	Cut & Cover Box - 2 Track / 1 Box (50' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	3,922.000	lb	1.30	5,099	6,454	1.65		P	CC-Det	217 lb/cy	$ 0.60	$ 5.68	$ 2,353	$ 22,277
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	8.070	cy	320.03	2,583	3,255	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 2,018	$ 9,312
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	7.780	cy	395.18	3,075	3,877	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 1,789	$ 5,462
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	2.220	cy	470.28	1,044	1,315	592.37		P	CC-Det		$ 230.00	$ 702.00	$ 511	$ 1,558
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	8.070	cy	546.16	4,407	5,557	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 3,551	$ 17,754
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	185.000	sf	6.19	1,145	1,440	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 749	$ 3,360
	07-17-13.10	A010	Composite Drainage Board	76.000	sf	2.08	158	197	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 304	$ 1,292
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.060	sy	5.54	34	43	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 36
	31-23-16.16	A010	Structural Excavation	100.930	cy	21.83	2,204	2,821	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 404	$ 18,672
	31-23-23.14	A010	Structrual Backfill	24.220	cy	17.17	416	532	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 242	$ 12,255
	31-52-16.10	A010	Soldier Pile & Lagging	100.000	sf	72.32	7,232	9,083	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 13,397	$ 34,778
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.22		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	76.710	cy	12.96	994	1,222	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 173	$ 21,862
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	6.610	sy	49.77	329	410	61.96		P	CC-Det		$ 12.00	$ 238.80	$ 79	$ 1,578
	05-12-23.77	A010	Structural Steel (for Bracing)	0.350	ton	2,103.43	736	924	2,639.20		P	CC-Det		$ 600.00	$ 20,000.00	$ 210	$ 7,000
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	6.610	sy	0.49	3	4	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 12
			Cut & Cover Box - 2 Track / 1 Box (50' Avg. Exc Depth)	1.000	RF		29,839	37,612			P	CC-Det			Subtotal	$ 27,362	$ 164,677
								$ 200,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 27,366	$ 164,681
															Per Mile	$ 150,000,000	$ 870,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.216		CC	Cut & Cover Box - 2 Track / 1 Box (60' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	4,972.000	lb	1.30	6,464	8,182	1.65		P	CC-Det	219 lb/cy	$ 0.60	$ 5.68	$ 2,983	$ 28,241
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	10.460	cy	320.03	3,348	4,219	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 2,615	$ 12,069
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	10.000	cy	395.18	3,952	4,983	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 2,300	$ 7,020
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	2.220	cy	470.28	1,044	1,315	592.37		P	CC-Det		$ 230.00	$ 702.00	$ 511	$ 1,558
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	10.460	cy	546.16	5,713	7,203	688.65		P	CC-Det		$ 440.00	$ 2,200.00	$ 4,602	$ 23,012
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	193.000	sf	6.19	1,195	1,502	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 782	$ 3,505
	07-17-13.10	A010	Composite Drainage Board	80.000	sf	2.08	166	207	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 320	$ 1,360
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.280	sy	5.54	35	45	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 38
	31-23-16.16	A010	Structural Excavation	125.560	cy	21.83	2,741	3,509	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 502	$ 23,229
	31-23-23.14	A010	Structrual Backfill	41.850	cy	17.17	718	920	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 419	$ 21,176
	31-52-16.10	A010	Soldier Pile & Lagging	120.000	sf	72.32	8,679	10,899	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 16,076	$ 41,734
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.26		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.22		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	83.710	cy	12.96	1,085	1,334	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 188	$ 23,857
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,610.00		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	6.830	sy	49.76	340	423	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 82	$ 1,631
	05-12-23.77	A010	Structural Steel (for Bracing)	0.480	ton	2,103.44	1,010	1,267	2,639.23		P	CC-Det		$ 600.00	$ 20,000.00	$ 288	$ 9,600
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	6.830	sy	0.49	3	4	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 12
			Cut & Cover Box - 2 Track / 1 Box (60' Avg. Exc Depth)	1.000	RF		36,873	46,491			P	CC-Det			Subtotal	$ 33,251	$ 205,510
								$ 250,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 33,255	$ 205,514
															Per Mile	$ 180,000,000	$ 1,090,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.224		CC	Cut & Cover Box - 2 Track/ 2 Box (40' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	4,236.000	lb	1.30	5,507	6,971	1.65		P	CC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 2,542	$ 24,060
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	7.450	cy	320.03	2,384	3,005	403.38		P	CC-Det		$ 250.00	$ 1,153.85	$ 1,863	$ 8,596
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	13.330	cy	395.18	5,268	6,643	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 3,066	$ 9,358
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	7.450	cy	546.16	4,069	5,131	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 3,278	$ 16,390
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	411.000	sf	6.19	2,544	3,199	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,665	$ 7,464
	07-17-13.10	A010	Composite Drainage Board	148.000	sf	2.08	308	383	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 592	$ 2,516
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.390	sy	5.54	35	45	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 38
	31-23-16.16	A010	Structural Excavation	89.440	cy	21.83	1,953	2,500	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 358	$ 16,546
	31-23-23.14	A010	Structrual Backfill	10.650	cy	17.17	183	234	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 107	$ 5,389
	31-52-16.10	A010	Soldier Pile & Lagging	160.000	sf	72.32	11,571	14,533	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 21,435	$ 55,645
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.26		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.22		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	78.790	cy	12.96	1,021	1,256	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 177	$ 22,455
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	32-06-10.10	A100	Site Restoration Allowance	7.500	sy	49.76	373	465	61.96		P	CC-Det		$ 12.00	$ 238.80	$ 90	$ 1,791
	31-74-13.30	A100	Crosspassage Allowance, 60' to 70' Tunnel Centerlines	0.001	ea	600,000.00	600	690	690,000.00		P	CC-Det				FP	FP
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,610.00		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	05-12-23.77	A010	Structural Steel (for Bracing)	0.180	ton	2,103.44	379	475	2,639.28		P	CC-Det		$ 600.00	$ 20,000.00	$ 108	$ 3,600
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	7.500	sy	0.49	4	5	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 14
			Cut & Cover Box - 2 Track/ 2 Box (40' Avg. Exc Depth)	1.000	RF		36,583	46,015			P	CC-Det			Subtotal	$ 36,862	$ 181,330
								$ 250,000,000	Per Mile						Fixed Price	$ 698	$ 698
															Total	$ 37,560	$ 182,028
															Per Mile	$ 200,000,000	$ 970,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.225		CC	Cut & Cover Box - 2 Track / 2 Box (50' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	4,978.000	lb	1.30	6,472	8,192	1.65		P	CC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 2,987	$ 28,275
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	8.810	cy	320.03	2,819	3,554	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 2,203	$ 10,165
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	15.560	cy	395.18	6,149	7,754	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 3,579	$ 10,923
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	8.810	cy	546.16	4,812	6,067	688.65		P	CC-Det		$ 440.00	$ 2,200.00	$ 3,876	$ 19,382
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	423.000	sf	6.19	2,618	3,293	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,713	$ 7,682
	07-17-13.10	A010	Composite Drainage Board	152.000	sf	2.08	316	394	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 608	$ 2,584
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.52		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.610	sy	5.54	37	47	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 40
	31-23-16.16	A010	Structural Excavation	110.190	cy	21.83	2,406	3,080	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 441	$ 20,385
	31-23-23.14	A010	Structrual Backfill	26.440	cy	17.17	454	581	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 264	$ 13,379
	31-52-16.10	A010	Soldier Pile & Lagging	200.000	sf	72.32	14,464	18,166	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 26,794	$ 69,556
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.22		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.01		P	CC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	83.750	cy	12.96	1,085	1,335	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 188	$ 23,869
	32-06-10.10	A100	Site Restoration Allowance	7.720	sy	49.76	384	478	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 93	$ 1,844
	31-74-13.30	A100	Crosspassage Allowance, 60' to 70' Tunnel Centerlines	0.001	ea	600,000.00	600	690	690,000.00		P	CC-Det				FP	FP
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	05-12-23.77	A010	Structural Steel (for Bracing)	0.280	ton	2,103.46	589	739	2,639.25		P	CC-Det		$ 600.00	$ 20,000.00	$ 168	$ 5,600
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	7.720	sy	0.50	4	5	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 14
			Cut & Cover Box - 2 Track / 2 Box (50' Avg. Exc Depth)	1.000	RF		43,593	54,854			P	CC-Det			Subtotal	$ 44,497	$ 221,165
								$ 290,000,000	Per Mile						Fixed Price	$ 698	$ 698
															Total	$ 45,195	$ 221,863
															Per Mile	$ 240,000,000	$ 1,180,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.226		CC	Cut & Cover Box - 2 Track / 2 Box (60' Avg. Exc Depth)							CC	P	CC-Det					
TRUE	03-21-10.60	A010	Reinforcing Steel	6,528.000	lb	1.30	8,487	10,743	1.65		P	CC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 3,917	$ 37,079
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	11.760	cy	320.03	3,764	4,744	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 2,940	$ 13,569
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	20.000	cy	395.18	7,904	9,967	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 4,600	$ 14,040
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	11.760	cy	546.16	6,423	8,099	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 5,174	$ 25,872
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	447.000	sf	6.19	2,767	3,479	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,810	$ 8,118
	07-17-13.10	A010	Composite Drainage Board	160.000	sf	2.08	332	414	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 640	$ 2,720
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	7.060	sy	5.54	39	50	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 42
	31-23-16.16	A010	Structural Excavation	141.110	cy	21.83	3,081	3,944	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 564	$ 26,105
	31-23-23.14	A010	Structrual Backfill	47.040	cy	17.17	808	1,034	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 470	$ 23,802
	31-52-16.10	A010	Soldier Pile & Lagging	240.000	sf	72.32	17,357	21,799	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 32,153	$ 83,467
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	94.070	cy	12.96	1,219	1,499	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 212	$ 26,810
	32-06-10.10	A100	Site Restoration Allowance	8.170	sy	49.76	407	506	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 98	$ 1,951
	31-74-13.30	A100	Crosspassage Allowance, 60' to 70' Tunnel Centerlines	0.001	ea	600,000.00	600	690	690,000.00		P	CC-Det				FP	FP
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	05-12-23.77	A010	Structural Steel (for Bracing)	0.370	ton	2,103.46	778	977	2,639.19		P	CC-Det		$ 600.00	$ 20,000.00	$ 222	$ 7,400
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	8.170	sy	0.49	4	5	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 15
			Cut & Cover Box - 2 Track / 2 Box (60' Avg. Exc Depth)	1.000	RF		54,353	68,430			P	CC-Det			Subtotal	$ 54,384	$ 278,459
								$ 370,000,000	Per Mile						Fixed Price	$ 698	$ 698
															Total	$ 55,082	$ 279,157
															Per Mile	$ 300,000,000	$ 1,480,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.414		CC	Cut & Cover Box - 4 Track / 1 Box (40' Avg. Exc Depth)							CC	P	CC-Det					
TRUE	03-21-10.60	A010	Reinforcing Steel	5,000.000	lb	1.30	6,500	8,228	1.65		P	CC-Det	231 lb/cy	$ 0.60	$ 5.68	$ 3,000	$ 28,400
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	11.670	cy	320.03	3,735	4,708	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 2,918	$ 13,465
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	6.670	cy	395.18	2,636	3,324	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 1,534	$ 4,682
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	3.330	cy	470.29	1,566	1,973	592.37		P	CC-Det		$ 230.00	$ 702.00	$ 766	$ 2,338
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	11.670	cy	546.16	6,374	8,037	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 5,135	$ 25,674
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	254.000	sf	6.19	1,572	1,977	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,029	$ 4,613
	07-17-13.10	A010	Composite Drainage Board	74.000	sf	2.08	154	192	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 296	$ 1,258
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	10.000	sy	5.54	55	71	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 4	$ 60
	31-23-16.16	A010	Structural Excavation	140.000	cy	21.83	3,057	3,913	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 560	$ 25,900
	31-23-23.14	A010	Structrual Backfill	16.670	cy	17.17	286	366	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 167	$ 8,435
	31-52-16.10	A010	Soldier Pile & Lagging	80.000	sf	72.32	5,786	7,266	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 10,718	$ 27,822
	33-71-19.17	A060	Cable Duct, Underground Guideway	4.000	lf	41.74	167	209	52.26		P	CC-Det		$ 3.50	$ 615.00	$ 14	$ 2,460
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.22		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	4.000	lf	27.19	109	136	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 36	$ 900
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	123.330	cy	12.96	1,598	1,965	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 277	$ 35,149
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,610.00		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	10.560	sy	49.76	526	654	61.96		P	CC-Det		$ 12.00	$ 238.80	$ 127	$ 2,522
	05-12-23.77	A010	Structural Steel (for Bracing)	0.350	ton	2,103.43	736	924	2,639.20		P	CC-Det		$ 600.00	$ 20,000.00	$ 210	$ 7,000
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	10.560	sy	0.49	5	7	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 19
			Cut & Cover Box - 4 Track / 1 Box (40' Avg. Exc Depth)	1.000	RF		35,199	44,372			P	CC-Det			Subtotal	$ 28,804	$ 197,889
								$ 240,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 28,812	$ 197,897
															Per Mile	$ 160,000,000	$ 1,050,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.415		CC	Cut & Cover Box - 4 Track / 1 Box (50' Avg. Exc Depth)							CC	P	CC-Det					
TRUE	03-21-10.60	A010	Reinforcing Steel	5,711.000	lb	1.30	7,425	9,398	1.65		P	CC-Det	232 lb/cy	$ 0.60	$ 5.68	$ 3,427	$ 32,438
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	13.480	cy	320.03	4,314	5,438	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 3,370	$ 15,554
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	7.780	cy	395.18	3,075	3,877	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 1,789	$ 5,462
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	3.330	cy	470.29	1,566	1,973	592.37		P	CC-Det		$ 230.00	$ 702.00	$ 766	$ 2,338
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	13.480	cy	546.16	7,362	9,283	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 5,931	$ 29,656
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	258.000	sf	6.19	1,597	2,008	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,045	$ 4,685
	07-17-13.10	A010	Composite Drainage Board	76.000	sf	2.08	158	197	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 304	$ 1,292
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	10.110	sy	5.54	56	72	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 4	$ 61
	31-23-16.16	A010	Structural Excavation	168.520	cy	21.83	3,679	4,710	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 674	$ 31,176
	31-23-23.14	A010	Structrual Backfill	40.440	cy	17.17	694	889	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 404	$ 20,463
	31-52-16.10	A010	Soldier Pile & Lagging	100.000	sf	72.32	7,232	9,083	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 13,397	$ 34,778
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.22		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	4.000	lf	27.19	109	136	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 36	$ 900
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	128.080	cy	12.96	1,660	2,041	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 288	$ 36,503
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	10.670	sy	49.76	531	661	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 128	$ 2,548
	05-12-23.77	A010	Structural Steel (for Bracing)	0.540	ton	2,103.46	1,136	1,425	2,639.26		P	CC-Det		$ 600.00	$ 20,000.00	$ 324	$ 10,800
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	10.670	sy	0.49	5	7	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 20
			Cut & Cover Box - 4 Track / 1 Box (50' Avg. Exc Depth)	1.000	RF		41,020	51,724			P	CC-Det			Subtotal	$ 33,910	$ 237,095
								$ 280,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 33,918	$ 237,103
															Per Mile	$ 180,000,000	$ 1,260,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.416		CC	Cut & Cover Box - 4 Track / 1 Box (60' Avg. Exc Depth)							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	7,166.670	lb	1.30	9,317	11,794	1.65		P	CC-Det	235 lb/cy	$ 0.60	$ 5.68	$ 4,300	$ 40,707
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	17.220	cy	320.03	5,511	6,946	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 4,305	$ 19,869
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	10.000	cy	395.18	3,952	4,983	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 2,300	$ 7,020
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	3.330	cy	470.29	1,566	1,973	592.38		P	CC-Det		$ 230.00	$ 702.00	$ 766	$ 2,338
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	17.220	cy	546.16	9,405	11,859	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 7,577	$ 37,884
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	266.000	sf	6.19	1,646	2,071	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,077	$ 4,831
	07-17-13.10	A010	Composite Drainage Board	80.000	sf	2.08	166	207	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 320	$ 1,360
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	10.330	sy	5.54	57	73	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 4	$ 62
	31-23-16.16	A010	Structural Excavation	206.670	cy	21.83	4,512	5,776	27.95		P	CC-Det		$ 4.00	$ 185.00	$ 827	$ 38,234
	31-23-23.14	A010	Structrual Backfill	68.890	cy	17.17	1,183	1,514	21.98		P	CC-Det		$ 10.00	$ 506.00	$ 689	$ 34,858
	31-52-16.10	A010	Soldier Pile & Lagging	120.000	sf	72.32	8,679	10,899	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 16,076	$ 41,734
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	CC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	4.000	lf	27.19	109	136	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 36	$ 900
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	137.780	cy	12.96	1,785	2,196	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 310	$ 39,267
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	10.890	sy	49.76	542	675	61.96		P	CC-Det		$ 12.00	$ 238.80	$ 131	$ 2,601
	05-12-23.77	A010	Structural Steel (for Bracing)	0.720	ton	2,103.44	1,514	1,900	2,639.21		P	CC-Det		$ 600.00	$ 20,000.00	$ 432	$ 14,400
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	10.890	sy	0.49	5	7	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 20
			Cut & Cover Box - 4 Track / 1 Box (60' Avg. Exc Depth)	1.000	RF		50,371	63,536			P	CC-Det			Subtotal	$ 41,172	$ 294,506
								$ 340,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 41,180	$ 294,514
															Per Mile	$ 220,000,000	$ 1,560,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.06.922		CC	Double Deck - 2 Track Trench on Top of 2 Track C&C Box							CC	P	CC-Det					
	03-21-10.60	A010	Reinforcing Steel	4,498.000	lb	1.30	5,848	7,402	1.65		P	CC-Det	205 lb/cy	$ 0.60	$ 5.68	$ 2,699	$ 25,549
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	10.930	cy	320.03	3,498	4,409	403.39		P	CC-Det		$ 250.00	$ 1,153.85	$ 2,733	$ 12,612
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	8.760	cy	395.18	3,462	4,365	498.33		P	CC-Det		$ 230.00	$ 702.00	$ 2,015	$ 6,150
	03-30-53.40	A160	Structural Concrete, In Place, C&C Interior Walls	2.220	cy	470.28	1,044	1,315	592.37		P	CC-Det		$ 230.00	$ 702.00	$ 511	$ 1,558
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	8.070	cy	546.16	4,407	5,557	688.66		P	CC-Det		$ 440.00	$ 2,200.00	$ 3,551	$ 17,754
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	CC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	317.500	sf	6.19	1,965	2,471	7.78		P	CC-Det		$ 4.05	$ 18.16	$ 1,286	$ 5,766
	07-17-13.10	A010	Composite Drainage Board	105.500	sf	2.08	219	273	2.59		P	CC-Det		$ 4.00	$ 17.00	$ 422	$ 1,794
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	CC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.060	sy	5.54	34	43	7.09		P	CC-Det		$ 0.35	$ 6.00	$ 2	$ 36
	31-23-16.16	A010	Structural Excavation	100.930	cy	21.83	2,204	2,821	27.95		P	CC-Det	Fill?	$ 4.00	$ 185.00	$ 404	$ 18,672
	31-52-16.10	A010	Soldier Pile & Lagging	100.000	sf	72.32	7,232	9,083	90.83		P	CC-Det		$ 133.97	$ 347.78	$ 13,397	$ 34,778
	33-71-19.17	A060	Cable Duct, Underground Guideway	4.000	lf	41.74	167	209	52.26		P	CC-Det		$ 3.50	$ 615.00	$ 14	$ 2,460
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	CC-Det				FP	FP
	05-52-13.50	A010	Safety Railing	4.000	lf	27.19	109	136	34.02		P	CC-Det		$ 9.00	$ 225.00	$ 36	$ 900
	10-14-19.10	A050	Signage Allowance, Tunnels	2.000	lf	15.00	30	35	17.25		P	CC-Det		$ 1.00	$ 110.00	$ 2	$ 220
	31-23-23.20	A010	Haul and Dispose of Excavated Material	100.930	cy	12.96	1,308	1,609	15.94		P	CC-Det		$ 2.25	$ 285.00	$ 227	$ 28,765
	31-74-13.30	A120	Crosspassage Doors	0.003	ea	2,883.00	9	11	3,613.33		P	CC-Det		$ 865.00	$ 17,000.00	$ 3	$ 51
	32-06-10.10	A100	Site Restoration Allowance	6.610	sy	49.77	329	410	61.95		P	CC-Det		$ 12.00	$ 238.80	$ 79	$ 1,578
	05-12-23.77	A010	Structural Steel (for Bracing)	0.570	ton	2,103.44	1,199	1,504	2,639.23		P	CC-Det		$ 600.00	$ 20,000.00	$ 342	$ 11,400
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	6.610	sy	0.49	3	4	0.63		P	CC-Det		$ 0.04	$ 1.83	$ 0	$ 12
			Double Deck - 2 Track Trench on Top of 2 Track C&C Box	1.000	RF		33,365	42,035			P	CC-Det			Subtotal	$ 29,732	$ 176,975
								$ 222,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 29,740	$ 176,983
															Per Mile	$ 160,000,000	$ 940,000,000
10.07.801		SS	Ventilation Shaft							SS	P	SS-Det					
	03-21-10.60	A010	Reinforcing Steel	1,300.000	lb	1.30	1,690	2,139	1.65		P	SS-Det	200 lb/cy				
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	0.700	cy	320.03	224	282	403.37		P	SS-Det					
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	5.300	cy	395.19	2,094	2,641	498.33		P	SS-Det					
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	0.500	cy	546.16	273	344	688.66		P	SS-Det					
	07-13-53.10	A010	Sheet Waterproofing	72.000	sf	6.19	446	560	7.78		P	SS-Det					
	07-17-13.10	A010	Composite Drainage Board	72.000	sf	2.08	150	187	2.59		P	SS-Det					
	31-23-19.20	A010	Dewatering Allowance	0.900	day	219.96	198	253	281.54		P	SS-Det					
	31-22-16.10	A010	Finish Grading	0.700	sy	5.54	4	5	7.09		P	SS-Det					
	31-23-16.16	A010	Structural Excavation	12.000	cy	21.83	262	335	27.95		P	SS-Det					
	31-23-23.14	A010	Structrual Backfill	1.800	cy	17.17	31	40	21.98		P	SS-Det					
	31-52-16.10	A010	Soldier Pile & Lagging	72.000	sf	72.32	5,207	6,540	90.83		P	SS-Det					
	31-23-23.20	A010	Haul and Dispose of Excavated Material	10.200	cy	12.96	132	163	15.94		P	SS-Det					
	32-06-10.10	A100	Site Restoration Allowance	0.700	sy	49.76	35	43	61.94		P	SS-Det					
	22-03-00.10	A015	Mechanical Allowance, Misc. Structure	19.400	sf	10.00	194	223	11.50		P	SS-Det					
	26-03-00.10	A015	Electrical Allowance, Misc. Structure	19.400	sf	22.00	427	491	25.30		P	SS-Det					
			Ventilation Shaft	1.000	VF		11,367	14,247			P	SS-Det			Subtotal	$ -	$ -
															Fixed Price	$ -	$ -
															Total	$ -	$ -

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.07.802		SS	Mid-Line Ventilation Structure							SS	P	SS-Det					
	03-21-10.60	A010	Reinforcing Steel	804,000.000	lb	1.30	1,045,278	1,323,066	1.65		P	SS-Det	207 lb/cy				
	03-30-53.40	A115	Structural Concrete, In Place, Slab on Grade	1,130.000	cy	226.71	256,184	322,262	285.19		P	SS-Det					
	03-30-53.40	A120	Structural Concrete, In Place, Walls	1,670.000	cy	373.37	623,530	785,931	470.62		P	SS-Det					
	03-30-53.40	A130	Structural Concrete, In Place, Beams & Girders	180.000	cy	790.45	142,281	179,680	998.22		P	SS-Det					
	03-30-53.40	A140	Structural Concrete, In Place, Elevated Slab	910.000	cy	451.00	410,414	515,843	566.86		P	SS-Det					
	07-13-53.10	A010	Sheet Waterproofing	10,160.000	sf	6.19	62,882	79,084	7.78		P	SS-Det					
	07-17-13.10	A010	Composite Drainage Board	27,132.000	sf	2.08	56,377	70,285	2.59		P	SS-Det					
	31-23-19.20	A010	Dewatering Allowance	260.000	day	219.95	57,187	73,199	281.53		P	SS-Det					
	31-22-16.10	A010	Finish Grading	1,175.000	sy	5.54	6,508	8,331	7.09		P	SS-Det					
	31-23-16.16	A010	Structural Excavation	15,990.000	cy	21.83	349,126	446,881	27.95		P	SS-Det					
	31-23-23.14	A010	Structrual Backfill	4,830.000	cy	17.17	82,922	106,141	21.98		P	SS-Det					
	31-52-16.10	A010	Soldier Pile & Lagging	27,140.000	sf	72.32	1,962,805	2,465,080	90.83		P	SS-Det					
	03-30-53.40	A010	Mud Slab	200.000	cy	201.31	40,261	50,656	253.28		P	SS-Det					
	31-25-13.10	A010	Erosion Control Allowance	500.000	lf	2.47	1,236	1,569	3.14		P	SS-Det					
	09-03-00.10	A050	Architectural Finishs Allowance, Non-Public Space	17,130.000	sf	50.00	856,500	984,975	57.50		P	SS-Det					
	31-23-23.20	A010	Haul and Dispose of Excavated Material	14,500.000	cy	12.96	187,895	231,081	15.94		P	SS-Det					
	03-41-23.50	A010	Precast Stairs	80.000	vlf	284.69	22,775	28,494	356.17		P	SS-Det					
	32-06-10.10	A100	Site Restoration Allowance	1,175.000	sy	49.76	58,473	72,797	61.95		P	SS-Det					
	05-12-23.77	A010	Structural Steel (for Bracing)	32.000	ton	2,103.45	67,310	84,455	2,639.22		P	SS-Det					
	22-03-00.10	A015	Mechanical Allowance, Misc. Structure	17,130.000	sf	10.00	171,300	196,995	11.50		P	SS-Det					
	26-03-00.10	A015	Electrical Allowance, Misc. Structure	17,130.000	sf	22.00	376,860	433,389	25.30		P	SS-Det					
	26-03-00.10	A110	Lighting Allowance, Station	17,130.000	sf	8.00	137,040	157,596	9.20		P	SS-Det					
	03-30-53.40	A125	Structural Concrete, In Place, Columns	130.000	cy	757.86	98,522	124,157	955.05		P	SS-Det					
	31-32-36.16	A020	Grouted soil nail, # 8 bar - 20 ft long	210.000	ea	388.74	81,634	103,376	492.27		P	SS-Det					
	23-03-00.10	A100	Ventilation Building Louver/Screen Allowance	1.000	ls	250,000.00	250,000	287,500	287,500.00		P	SS-Det					
			Mid-Line Ventilation Structure	1.000	LS		7,405,302	9,132,822			P	SS-Det			Subtotal	$ -	$ -
															Fixed Price	$ -	$ -
															Total	$ -	$ -

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.07.803		SS	Tunnel Portal Structure							SS	P	SS-Det					
	03-21-10.60	A010	Reinforcing Steel	644,000	lb	1.30	837,262	1,059,769	1.65		P	SS-Det	200 lb/cy	$ 0.60	$ 5.68	$ 386,400	$ 3,657,920
	03-30-53.40	A115	Structural Concrete, In Place, Slab on Grade	880	cy	226.71	199,506	250,965	285.19		P	SS-Det		$ 250.00	$ 1,153.85	$ 220,000	$ 1,015,388
	03-30-53.40	A120	Structural Concrete, In Place, Walls	1,000	cy	373.37	373,371	470,618	470.62		P	SS-Det		$ 230.00	$ 702.00	$ 230,000	$ 702,000
	03-30-53.40	A130	Structural Concrete, In Place, Beams & Girders	170	cy	790.45	134,377	169,698	998.22		P	SS-Det		$ 575.00	$ 2,200.00	$ 97,750	$ 374,000
	03-30-53.40	A140	Structural Concrete, In Place, Elevated Slab	940	cy	451.00	423,944	532,849	566.86		P	SS-Det		$ 440.00	$ 2,200.00	$ 413,600	$ 2,068,000
	03-30-53.40	A125	Structural Concrete, In Place, Columns	230	cy	757.86	174,308	219,662	955.05		P	SS-Det		$ 405.00	$ 816.00	$ 93,150	$ 187,680
	07-17-13.10	A010	Composite Drainage Board	15,950	sf	2.08	33,142	41,318	2.59		P	SS-Det		$ 4.00	$ 17.00	$ 63,800	$ 271,150
	31-23-19.20	A010	Dewatering Allowance	180	day	219.95	39,591	50,676	281.53		P	SS-Det				FP	FP
	31-22-16.10	A010	Finish Grading	1,900	sy	5.54	10,524	13,471	7.09		P	SS-Det		$ 0.35	$ 6.00	$ 665	$ 11,400
	31-23-16.16	A010	Structural Excavation	21,300	cy	21.83	465,064	595,282	27.95		P	SS-Det		$ 4.00	$ 185.00	$ 85,200	$ 3,940,500
	31-23-23.14	A010	Structrual Backfill	950	cy	17.17	16,310	20,877	21.98		P	SS-Det		$ 10.00	$ 506.00	$ 9,500	$ 480,700
	31-52-16.10	A010	Soldier Pile & Lagging	15,950	sf	72.32	1,153,528	1,448,711	90.83		P	SS-Det		$ 133.97	$ 347.78	$ 2,136,822	$ 5,547,091
	03-30-53.40	A010	Mud Slab	320	cy	201.31	64,418	81,050	253.28		P	SS-Det		$ 250.00	$ 1,153.85	$ 80,000	$ 369,232
	31-25-13.10	A010	Erosion Control Allowance	1,000	lf	2.47	2,473	3,139	3.14		P	SS-Det				FP	FP
	09-03-00.10	A050	Architectural Finishs Allowance, Non-Public Space	22,430	sf	50.00	1,121,500	1,289,725	57.50		P	SS-Det				FP	FP
	31-23-23.20	A010	Haul and Dispose of Excavated Material	26,500	cy	12.96	343,395	422,320	15.94		P	SS-Det		$ 1.00	$ 110.00	$ 26,500	$ 2,915,000
	03-41-23.50	A010	Precast Stairs	80	vlf	284.69	22,775	28,494	356.17		P	SS-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	1,900	sy	49.76	94,551	117,714	61.95		P	SS-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	15	ton	2,103.45	31,552	39,588	2,639.22		P	SS-Det		$ 600.00	$ 2,000.00	$ 9,000	$ 30,000
	22-03-00.10	A015	Mechanical Allowance, Misc. Structure	22,430	sf	10.00	224,300	257,945	11.50		P	SS-Det				FP	FP
	26-03-00.10	A015	Electrical Allowance, Misc. Structure	22,430	sf	22.00	493,460	567,479	25.30		P	SS-Det				FP	FP
	26-03-00.10	A110	Lighting Allowance, Station	22,430	sf	8.00	179,440	206,356	9.20		P	SS-Det				FP	FP
	23-03-00.10	A100	Ventilation Building Louver/Screen Allowance	1	ls	250,000.00	250,000	287,500	287,500.00		P	SS-Det				FP	FP
	32-31-13.20	A010	6 ft. Chain Link Fence	2,150	lf	29.63	63,695	79,402	36.93		P	SS-Det		$ 6.00	$ 140.00	$ 12,900	$ 301,000
	32-31-13.20	A060	Chain Link Gates, 20' Opening	1	opng	1,668.76	1,669	2,092	2,092.24		P	SS-Det		$ 300.00	$ 7,000.00	$ 300	$ 7,000
	33-47-13.53	A010	Storm Water Management Pond	1,110	sy	22.78	25,285	32,243	29.05		P	SS-Det				FP	FP
	32-11-23.23	A010	Aggregate Base (cy)	490	cy	23.84	11,683	14,737	30.08		P	SS-Det		$ 19.00	$ 250.00	$ 9,310	$ 122,500
	32-12-16.13	A010	Asphalt Concrete Paving	635	ton	75.00	47,627	59,416	93.57		P	SS-Det		$ 80.00	$ 2,000.00	$ 50,800	$ 1,270,000
	33-41-13.60	A100	Roadway Drainage, Allowance	1,325	lf	67.96	90,043	113,315	85.52		P	SS-Det				FP	FP
			Tunnel Portal Structure	1	LS		6,928,792	8,476,410			P	SS-Det			Subtotal	$ 3,925,697	$ 23,270,561
											P				Fixed Price	$ 2,954,586	$ 2,954,586
															Total	$ 6,880,283	$ 26,225,147
											P					Cut & Cover Model	

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.07.805		SS	Emergency Access Shaft							SS	P	SS-Det					
	03-21-10.60	A010	Reinforcing Steel	2,500.000	lb	1.30	3,250	4,114	1.65		P	SS-Det	202 lb/cy				
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	1.900	cy	320.03	608	766	403.38		P	SS-Det					
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	9.300	cy	395.18	3,675	4,634	498.33		P	SS-Det					
	03-30-53.40	A165	Structural Concrete, In Place, C&C Roof Slab	1.200	cy	546.16	655	826	688.65		P	SS-Det					
	07-13-53.10	A010	Sheet Waterproofing	100.000	sf	6.19	619	778	7.78		P	SS-Det					
	07-17-13.10	A010	Composite Drainage Board	100.000	sf	2.08	208	259	2.59		P	SS-Det					
	31-23-19.20	A010	Dewatering Allowance	0.900	day	219.96	198	253	281.56		P	SS-Det					
	31-22-16.10	A010	Finish Grading	1.400	sy	5.54	8	10	7.09		P	SS-Det					
	31-23-16.16	A010	Structural Excavation	23.100	cy	21.83	504	646	27.95		P	SS-Det					
	31-23-23.14	A010	Structrual Backfill	3.500	cy	17.17	60	77	21.98		P	SS-Det					
	31-52-16.10	A010	Soldier Pile & Lagging	100.000	sf	72.32	7,232	9,083	90.83		P	SS-Det					
	31-23-23.20	A010	Haul and Dispose of Excavated Material	19.600	cy	12.96	254	312	15.94		P	SS-Det					
	32-06-10.10	A100	Site Restoration Allowance	1.400	sy	49.76	70	87	61.95		P	SS-Det					
	22-03-00.10	A015	Mechanical Allowance, Misc. Structure	37.500	sf	10.00	375	431	11.50		P	SS-Det					
	26-03-00.10	A015	Electrical Allowance, Misc. Structure	37.500	sf	22.00	825	949	25.30		P	SS-Det					
	03-41-23.50	A010	Precast Stairs	1.000	vlf	284.70	285	356	356.19		P	SS-Det					
			Emergency Access Shaft	1.000	VF		18,826	23,583			P	SS-Det			Subtotal	$ -	$ -
															Fixed Price	$ -	$ -
															Total	$ -	$ -
10.07.850		SS	Pumping Station							SS	P	SS-Det					
	03-21-10.60	A010	Reinforcing Steel	3,315.000	lb	1.30	4,310	5,455	1.65		P	SS-Det	150 lb/cy				
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	5.800	cy	320.03	1,856	2,340	403.39		P	SS-Det					
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	16.300	cy	395.18	6,441	8,123	498.33		P	SS-Det					
	07-13-53.10	A010	Sheet Waterproofing	500.000	sf	6.19	3,095	3,892	7.78		P	SS-Det					
	07-17-13.10	A010	Composite Drainage Board	500.000	sf	2.08	1,039	1,295	2.59		P	SS-Det					
	31-23-19.20	A010	Dewatering Allowance	20.000	day	219.95	4,399	5,631	281.53		P	SS-Det					
	31-71-16.20	A010	Shaft Excavation and Support	46.500	cy	350.00	16,275	18,716	402.50		P	SS-Det					
	31-23-23.20	A010	Haul and Dispose of Excavated Material	46.500	cy	12.96	603	741	15.94		P	SS-Det					
	22-03-00.10	A015	Mechanical Allowance, Misc. Structure	78.500	sf	10.00	785	903	11.50		P	SS-Det					
	26-03-00.10	A015	Electrical Allowance, Misc. Structure	78.500	sf	22.00	1,727	1,986	25.30		P	SS-Det					
	33-45-00.10	A010	Drainage Pumping Station	1.000	ea	150,000.00	150,000	172,500	172,500.00		P	SS-Det					
			Pumping Station	1.000	EA		190,530	221,581			P	SS-Det					
															Subtotal	$ -	$ -
															Fixed Price	$ -	$ -
															Total	$ -	$ -
10.07.901		SS	Mechanical & Electrical Allowance for Underground (Single)							SS	P	SS-Det					
	22-03-00.10	A050	Fire Protection Allowance, Tunnel	1.000	lf	260.00	260	299	299.00		P	SS-Det					
	23-03-00.10	A050	Ventilation Allowance, Tunnel	1.000	lf	740.00	740	851	851.00		P	SS-Det					
	31-74-13.30	A050	Lighting Allowance, Tunnel	1.000	lf	160.00	160	184	184.00		P	SS-Det					
	33-41-13.60	A030	Trackway Drainage Allowance, Tunnel	1.000	lf	100.00	100	115	115.00		P	SS-Det					
			Mechanical & Electrical Allowance for Underground (Single)	1.000	RF		1,260	1,449			P	SS-Det					
								$ 7,700,000							Subtotal	$ -	$ -
															Fixed Price	$ -	$ -
															Total	$ -	$ -
10.07.902		SS	Mechanical & Electrical Allowance for Underground (Double)							SS	P	SS-Det					
	22-03-00.10	A050	Fire Protection Allowance, Tunnel	2.000	lf	260.00	520	598	299.00		P	SS-Det					
	23-03-00.10	A050	Ventilation Allowance, Tunnel	2.000	lf	740.00	1,480	1,702	851.00		P	SS-Det					
	31-74-13.30	A050	Lighting Allowance, Tunnel	2.000	lf	160.00	320	368	184.00		P	SS-Det					
	33-41-13.60	A030	Trackway Drainage Allowance, Tunnel	2.000	lf	100.00	200	230	115.00		P	SS-Det					
			Mechanical & Electrical Allowance for Underground (Double)	1.000	RF		2,520	2,898			P	SS-Det			Subtotal	$ -	$ -
								$ 16,000,000							Fixed Price	$ -	$ -
															Total	$ -	$ -

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.07.920		SS	Ventilation Equipment Allowance							SS	P	SS-Det					
	23-03-00.10	A080	Ventilation Equipment Allowance	1.000	ea	1,000,000.00	1,000,000	1,150,000	1,150,000.00		P	SS-Det					
			Ventilation Equipment Allowance	1.000	EA		1,000,000	1,150,000			P	SS-Det			Subtotal	$ -	$ -
															Fixed Price	$ -	$ -
															Total	$ -	$ -
10.07.950		SS	Allowance for Construction Monitoring							SS	P	SS-Det					
	31-74-13.30	A015	Construction Monitoring for Tunnel Construction	1.000	lf	25.00	25	29	28.75		P	SS-Det					
			Allowance for Construction Monitoring	1.000	RF		25	29			P	SS-Det			Subtotal	$ -	$ -
								$ 160,000							Fixed Price	$ -	$ -
															Total	$ -	$ -
															Per Mile	$ -	$ -
10.08.211		OC	Retained Cut, Trench - 1 Track (10' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	339.000	lb	1.30	441	558	1.65		P	OC-Det	149 lb/cy	$ 0.60	$ 5.68	$ 203	$ 1,926
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	1.280	cy	320.02	410	516	403.38		P	OC-Det		$ 250.00	$ 1,153.85	$ 320	$ 1,477
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	1.000	cy	395.18	395	498	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	05-53-16.50	A010	Service/Safety Walkway	1.000	lf	45.48	45	57	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	07-13-53.10	A010	Sheet Waterproofing	75.500	sf	6.19	467	588	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 306	$ 1,371
	07-17-13.10	A010	Composite Drainage Board	29.500	sf	2.08	61	76	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 118	$ 502
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	2.560	sy	5.54	14	18	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 1	$ 15
	31-23-16.16	A010	Structural Excavation	12.560	cy	21.83	274	351	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 50	$ 2,324
	31-52-16.10	A010	Soldier Pile & Lagging	29.500	sf	72.32	2,133	2,679	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 3,952	$ 10,260
	33-71-19.17	A060	Cable Duct, Underground Guideway	1.000	lf	41.74	42	52	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.080	ton	2,103.40	168	211	2,639.13		P	OC-Det		$ 600.00	$ 20,000.00	$ 48	$ 1,600
	05-52-13.50	A010	Safety Railing	1.000	lf	27.19	27	34	34.03		P	OC-Det		$ 9.00	$ 225.00	$ 9	$ 225
	31-23-23.20	A010	Haul and Dispose of Excavated Material	12.560	cy	12.96	163	200	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 28	$ 3,580
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	61.95		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	1.000	lf	128.92	129	165	164.98		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	2.560	sy	0.50	1	2	0.64		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 5
			Retained Cut, Trench - 1 Track (10' Avg. Exc Depth)	1.000	RF		4,896	6,165			P	OC-Det			Subtotal	$ 6,876	$ 30,951
								$ 40,000,000							Fixed Price	$ 4	$ 4
															Total	$ 6,880	$ 30,955
															Per Mile	$ 37,000,000	$ 170,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.212		OC	Retained Cut, Trench - 1 Track (20' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	1,526.000	lb	1.30	1,984	2,511	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 916	$ 8,668
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	4.150	cy	320.03	1,328	1,674	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 1,038	$ 4,788
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	6.030	cy	395.18	2,383	3,005	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 1,387	$ 4,233
	05-53-16.50	A010	Service/Safety Walkway	1.000	lf	45.48	45	57	57.08		P	OC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	07-13-53.10	A010	Sheet Waterproofing	110.500	sf	6.19	684	860	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 448	$ 2,007
	07-17-13.10	A010	Composite Drainage Board	54.500	sf	2.08	113	141	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 218	$ 927
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	3.110	sy	5.54	17	22	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 1	$ 19
	31-23-16.16	A010	Structural Excavation	28.260	cy	21.83	617	790	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 113	$ 5,228
	31-52-16.10	A010	Soldier Pile & Lagging	54.500	sf	72.32	3,942	4,950	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 7,301	$ 18,954
	33-71-19.17	A060	Cable Duct, Underground Guideway	1.000	lf	41.74	42	52	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.130	ton	2,103.46	273	343	2,639.23		P	OC-Det		$ 600.00	$ 20,000.00	$ 78	$ 2,600
	05-52-13.50	A010	Safety Railing	1.000	lf	27.19	27	34	34.02		P	OC-Det		$ 9.00	$ 225.00	$ 9	$ 225
	31-23-23.20	A010	Haul and Dispose of Excavated Material	28.260	cy	12.96	366	450	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 64	$ 8,054
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	61.95		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	1.000	lf	128.92	129	165	164.99		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.110	sy	0.49	2	2	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 6
			Retained Cut, Trench - 1 Track (20' Avg. Exc Depth)	1.000	RF		12,077	15,216			P	OC-Det			Subtotal	$ 13,182	$ 62,674
								$ 90,000,000							Fixed Price	$ 4	$ 4
															Total	$ 13,186	$ 62,678
															Per Mile	$ 70,000,000	$ 340,000,000
10.08.213		OC	Retained Cut, Trench - 1 Track (30' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	3,408.000	lb	1.30	4,431	5,608	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 2,045	$ 19,357
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	7.940	cy	320.03	2,541	3,203	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 1,985	$ 9,162
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	14.780	cy	395.18	5,841	7,365	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 3,399	$ 10,376
	05-53-16.50	A010	Service/Safety Walkway	1.000	lf	45.48	45	57	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	07-13-53.10	A010	Sheet Waterproofing	145.500	sf	6.19	901	1,133	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 589	$ 2,642
	07-17-13.10	A010	Composite Drainage Board	79.500	sf	2.08	165	206	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 318	$ 1,352
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	3.670	sy	5.54	20	26	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 1	$ 22
	31-23-16.16	A010	Structural Excavation	48.580	cy	21.83	1,061	1,358	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 194	$ 8,987
	31-52-16.10	A010	Soldier Pile & Lagging	79.500	sf	72.32	5,750	7,221	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 10,651	$ 27,649
	33-71-19.17	A060	Cable Duct, Underground Guideway	1.000	lf	41.74	42	52	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.190	ton	2,103.40	400	501	2,639.21		P	OC-Det		$ 600.00	$ 20,000.00	$ 114	$ 3,800
	05-52-13.50	A010	Safety Railing	1.000	lf	27.19	27	34	34.01		P	OC-Det		$ 9.00	$ 225.00	$ 9	$ 225
	31-23-23.20	A010	Haul and Dispose of Excavated Material	48.580	cy	12.96	630	774	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 109	$ 13,845
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	62.00		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	1.000	lf	128.92	129	165	164.98		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.670	sy	0.50	2	2	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 7
			Retained Cut, Trench - 1 Track (30' Avg. Exc Depth)	1.000	RF		22,107	27,864			P	OC-Det			Subtotal	$ 21,025	$ 104,389
								$ 150,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 21,029	$ 104,393
															Per Mile	$ 112,000,000	$ 560,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.221		OC	Retained Cut, Trench - 2 Track (10' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	576.000	lb	1.30	749	948	1.65		P	OC-Det	149 lb/cy	$ 0.60	$ 5.68	$ 346	$ 3,272
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	2.860	cy	320.04	915	1,154	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 715	$ 3,300
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	1.000	cy	395.18	395	498	498.34		P	OC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	132.500	sf	6.19	820	1,031	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 537	$ 2,406
	07-17-13.10	A010	Composite Drainage Board	29.500	sf	2.08	61	76	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 118	$ 502
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	5.720	sy	5.54	32	41	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 2	$ 34
	31-23-16.16	A010	Structural Excavation	28.130	cy	21.83	614	786	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 113	$ 5,204
	31-52-16.10	A010	Soldier Pile & Lagging	29.500	sf	72.32	2,133	2,679	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 3,952	$ 10,260
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.22		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.130	ton	2,103.46	273	343	2,639.15		P	OC-Det		$ 600.00	$ 20,000.00	$ 78	$ 2,600
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	28.130	cy	12.96	365	448	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 63	$ 8,017
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	62.00		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	1.000	lf	128.92	129	165	164.99		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	5.720	sy	0.49	3	4	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 10
			Retained Cut, Trench - 2 Track (10' Avg. Exc Depth)	1.000	RF		6,843	8,619			P	OC-Det			Subtotal	$ 8,015	$ 45,040
								$ 46,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 8,019	$ 45,044
															Per Mile	$ 43,000,000	$ 240,000,000
10.08.222		OC	Retained Cut, Trench - 2 Track (20' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	2,160.000	lb	1.30	2,808	3,555	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,296	$ 12,269
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	8.370	cy	320.03	2,679	3,376	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 2,093	$ 9,658
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	6.030	cy	395.18	2,383	3,005	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 1,387	$ 4,233
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	167.500	sf	6.19	1,037	1,304	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 678	$ 3,042
	07-17-13.10	A010	Composite Drainage Board	54.500	sf	2.08	113	141	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 218	$ 927
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.280	sy	5.54	35	45	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 2	$ 38
	31-23-16.16	A010	Structural Excavation	57.020	cy	21.83	1,245	1,594	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 228	$ 10,549
	31-52-16.10	A010	Soldier Pile & Lagging	54.500	sf	72.32	3,942	4,950	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 7,301	$ 18,954
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.220	ton	2,103.46	463	581	2,639.23		P	OC-Det		$ 600.00	$ 20,000.00	$ 132	$ 4,400
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	57.020	cy	12.96	739	909	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 128	$ 16,251
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	61.91		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	1.000	lf	128.92	129	165	164.99		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	6.280	sy	0.49	3	4	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 11
			Retained Cut, Trench - 2 Track (20' Avg. Exc Depth)	1.000	RF		15,928	20,073			P	OC-Det			Subtotal	$ 15,325	$ 89,064
								$ 110,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 15,329	$ 89,068
															Per Mile	$ 81,000,000	$ 480,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.223		OC	Retained Cut, Trench - 2 Track (30' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	4,438.000	lb	1.30	5,770	7,303	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 2,663	$ 25,208
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	14.810	cy	320.03	4,740	5,974	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 3,703	$ 17,089
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	14.780	cy	395.18	5,841	7,365	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 3,399	$ 10,376
	05-53-16.50	A010	Service/Safety Walkway	2.000	lf	45.48	91	114	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 460	$ 1,404
	07-13-53.10	A010	Sheet Waterproofing	202.500	sf	6.19	1,253	1,576	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 820	$ 3,677
	07-17-13.10	A010	Composite Drainage Board	79.500	sf	2.08	165	206	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 318	$ 1,352
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	6.830	sy	5.54	38	48	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 2	$ 41
	31-23-16.16	A010	Structural Excavation	90.540	cy	21.83	1,977	2,530	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 362	$ 16,750
	31-52-16.10	A010	Soldier Pile & Lagging	79.500	sf	72.32	5,750	7,221	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 10,651	$ 27,649
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.300	ton	2,103.47	631	792	2,639.23		P	OC-Det		$ 600.00	$ 20,000.00	$ 180	$ 6,000
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.03		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	90.540	cy	12.96	1,173	1,443	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 204	$ 25,804
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	61.91		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	1.000	lf	128.92	129	165	164.99		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	6.830	sy	0.49	3	4	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 12
			Retained Cut, Trench - 2 Track (30' Avg. Exc Depth)	1.000	RF		27,823	35,074			P	OC-Det			Subtotal	$ 24,163	$ 142,690
								$ 190,000,000	Per Mile						Fixed Price	$ 4	$ 4
															Total	$ 24,167	$ 142,694
															Per Mile	$ 130,000,000	$ 760,000,000
10.08.241		OC	Retained Cut, Trench - 4 Track (10' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	751.390	lb	1.30	977	1,236	1.65		P	OC-Det	149 lb/cy	$ 0.60	$ 5.68	$ 451	$ 4,268
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	4.030	cy	320.03	1,290	1,626	403.38		P	OC-Det		$ 250.00	$ 1,153.85	$ 1,008	$ 4,650
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	1.000	cy	395.18	395	498	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 230	$ 702
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	174.500	sf	6.19	1,080	1,358	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 707	$ 3,169
	07-17-13.10	A010	Composite Drainage Board	29.500	sf	2.08	61	76	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 118	$ 502
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	8.060	sy	5.54	45	57	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 3	$ 48
	31-23-16.16	A010	Structural Excavation	39.610	cy	21.83	865	1,107	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 158	$ 7,328
	31-52-16.10	A010	Soldier Pile & Lagging	29.500	sf	72.32	2,133	2,679	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 3,952	$ 10,260
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.170	ton	2,103.47	358	449	2,639.35		P	OC-Det		$ 600.00	$ 20,000.00	$ 102	$ 3,400
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.01		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	29.500	cy	12.96	382	470	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 66	$ 8,408
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	62.00		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	2.000	lf	128.92	258	330	164.98		P	OC-Det		$ 283.31	$ 1,483.80	$ 567	$ 2,968
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	8.060	sy	0.49	4	5	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 15
			Retained Cut, Trench - 4 Track (10' Avg. Exc Depth)	1.000	RF		8,295	10,456			P	OC-Det			Subtotal	$ 9,400	$ 54,369
								$ 56,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 9,408	$ 54,377
															Per Mile	$ 50,000,000	$ 290,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.242		OC	Retained Cut, Trench - 4 Track (20' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	2,626.390	lb	1.30	3,415	4,322	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,576	$ 14,918
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	11.480	cy	320.03	3,674	4,631	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 2,870	$ 13,246
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	6.030	cy	395.18	2,383	3,005	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 1,387	$ 4,233
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	209.500	sf	6.19	1,297	1,631	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 848	$ 3,805
	07-17-13.10	A010	Composite Drainage Board	54.500	sf	2.08	113	141	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 218	$ 927
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	8.610	sy	5.54	48	61	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 3	$ 52
	31-23-16.16	A010	Structural Excavation	78.220	cy	21.83	1,708	2,186	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 313	$ 14,471
	31-52-16.10	A010	Soldier Pile & Lagging	54.500	sf	72.32	3,942	4,950	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 7,301	$ 18,954
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.280	ton	2,103.46	589	739	2,639.29		P	OC-Det		$ 600.00	$ 20,000.00	$ 168	$ 5,600
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	78.220	cy	12.96	1,014	1,247	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 176	$ 22,293
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	62.00		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	2.000	lf	128.92	258	330	164.98		P	OC-Det		$ 283.31	$ 1,483.80	$ 567	$ 2,968
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	8.610	sy	0.49	4	5	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 16
			Retained Cut, Trench - 4 Track (20' Avg. Exc Depth)	1.000	RF		18,891	23,812			P	OC-Det			Subtotal	$ 17,465	$ 110,134
								$ 130,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 17,473	$ 110,142
															Per Mile	$ 93,000,000	$ 590,000,000
10.08.243		OC	Retained Cut, Trench - 4 Track (30' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	5,195.830	lb	1.30	6,755	8,550	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 3,117	$ 29,512
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	19.860	cy	320.03	6,356	8,011	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 4,965	$ 22,915
	03-30-53.40	A150	Structural Concrete, In Place, C&C Exterior Walls, Formed 1 Side	14.780	cy	395.18	5,841	7,365	498.33		P	OC-Det		$ 230.00	$ 702.00	$ 3,399	$ 10,376
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	07-13-53.10	A010	Sheet Waterproofing	244.500	sf	6.19	1,513	1,903	7.78		P	OC-Det		$ 4.05	$ 18.16	$ 990	$ 4,440
	07-17-13.10	A010	Composite Drainage Board	79.500	sf	2.08	165	206	2.59		P	OC-Det		$ 4.00	$ 17.00	$ 318	$ 1,352
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.54		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	9.170	sy	5.54	51	65	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 3	$ 55
	31-23-16.16	A010	Structural Excavation	121.460	cy	21.83	2,652	3,394	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 486	$ 22,470
	31-52-16.10	A010	Soldier Pile & Lagging	79.500	sf	72.32	5,750	7,221	90.83		P	OC-Det		$ 133.97	$ 347.78	$ 10,651	$ 27,649
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.22		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.370	ton	2,103.46	778	977	2,639.22		P	OC-Det		$ 600.00	$ 20,000.00	$ 222	$ 7,400
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.02		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	121.460	cy	12.96	1,574	1,936	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 273	$ 34,616
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	62.00		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	2.000	lf	128.92	258	330	164.98		P	OC-Det		$ 283.31	$ 1,483.80	$ 567	$ 2,968
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	9.170	sy	0.49	5	6	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 17
			Retained Cut, Trench - 4 Track (30' Avg. Exc Depth)	1.000	RF		32,144	40,528			P	OC-Det			Subtotal	$ 27,030	$ 172,423
								$ 220,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 27,038	$ 172,431
															Per Mile	$ 150,000,000	$ 920,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.344		OC	Retained Cut, Staged Trench - 4 Track (40' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	3,000.000	lb	1.30	3,901	4,937	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,800	$ 17,040
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	16.000	cy	320.03	5,121	6,454	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 4,000	$ 18,462
	03-30-53.40	A130	Structural Concrete, In Place, Beams & Girders	4.000	cy	790.45	3,162	3,993	998.22		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.10		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	31-56-23.20	A100	Deep Soil Mix Wall	53.000	sf	40.12	2,126	2,701	50.96		P	OC-Det		$ 57.00	$ 325.00	$ 3,021	$ 17,225
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	8.000	sy	5.54	44	57	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 3	$ 48
	31-23-16.16	A010	Structural Excavation	129.300	cy	21.83	2,823	3,614	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 517	$ 23,921
	31-56-23.20	A010	Slurry Wall	106.000	sf	90.56	9,600	12,164	114.76		P	OC-Det		$ 77.00	$ 234.00	$ 8,162	$ 24,804
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.370	ton	2,103.46	778	977	2,639.24		P	OC-Det		$ 600.00	$ 20,000.00	$ 222	$ 7,400
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.01		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	129.300	cy	12.96	1,676	2,061	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 291	$ 36,851
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	62.00		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	2.000	lf	128.92	258	330	164.99		P	OC-Det		$ 283.31	$ 1,483.80	$ 567	$ 2,968
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	8.900	sy	0.49	4	6	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 16
			Retained Cut, Staged Trench - 4 Track (40' Avg. Exc Depth)	1.000	RF		29,940	37,857			P	OC-Det			Subtotal	$ 21,541	$ 160,195
								$ 200,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 21,549	$ 160,203
															Per Mile	$ 120,000,000	$ 850,000,000
10.08.346		OC	Retained Cut, Staged Trench - 4 Track (60' Avg. Exc Depth)							OC	P	OC-Det					
	03-21-10.60	A010	Reinforcing Steel	3,000.000	lb	1.30	3,901	4,937	1.65		P	OC-Det	150 lb/cy	$ 0.60	$ 5.68	$ 1,800	$ 17,040
	03-30-53.40	A145	Structural Concrete, In Place, C&C Slab on Grade	16.000	cy	320.03	5,121	6,454	403.39		P	OC-Det		$ 250.00	$ 1,153.85	$ 4,000	$ 18,462
	03-30-53.40	A130	Structural Concrete, In Place, Beams & Girders	4.000	cy	790.45	3,162	3,993	998.23		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	05-53-16.50	A010	Service/Safety Walkway	4.000	lf	45.48	182	228	57.09		P	OC-Det		$ 230.00	$ 702.00	$ 920	$ 2,808
	31-56-23.20	A100	Deep Soil Mix Wall	73.000	sf	40.12	2,929	3,720	50.96		P	OC-Det		$ 57.00	$ 325.00	$ 4,161	$ 23,725
	31-23-19.20	A010	Dewatering Allowance	0.500	day	219.96	110	141	281.56		P	OC-Det		$ 2,180.85	$ 8,225.80	$ 1,090	$ 4,113
	31-22-16.10	A010	Finish Grading	8.000	sy	5.54	44	57	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 3	$ 48
	31-23-16.16	A010	Structural Excavation	182.700	cy	21.83	3,989	5,106	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 731	$ 33,800
	31-56-23.20	A010	Slurry Wall	146.000	sf	90.56	13,222	16,755	114.76		P	OC-Det		$ 77.00	$ 234.00	$ 11,242	$ 34,164
	33-71-19.17	A060	Cable Duct, Underground Guideway	2.000	lf	41.74	83	105	52.27		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	2.000	lf	3.35	7	8	4.21		P	OC-Det				FP	FP
	05-12-23.77	A010	Structural Steel (for Bracing)	0.550	ton	2,103.46	1,157	1,452	2,639.25		P	OC-Det		$ 600.00	$ 20,000.00	$ 330	$ 11,000
	05-52-13.50	A010	Safety Railing	2.000	lf	27.19	54	68	34.01		P	OC-Det		$ 9.00	$ 225.00	$ 18	$ 450
	31-23-23.20	A010	Haul and Dispose of Excavated Material	182.700	cy	12.96	2,367	2,912	15.94		P	OC-Det		$ 2.25	$ 285.00	$ 411	$ 52,070
	32-06-10.10	A100	Site Restoration Allowance	0.220	sy	49.77	11	14	61.91		P	OC-Det		$ 12.00	$ 238.80	$ 3	$ 53
	33-41-13.60	A020	Trackway Drainage Allowance, Underground	2.000	lf	128.92	258	330	164.99		P	OC-Det		$ 283.31	$ 1,483.80	$ 567	$ 2,968
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	8.900	sy	0.49	4	6	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 16
			Retained Cut, Staged Trench - 4 Track (60' Avg. Exc Depth)	1.000	RF		36,601	46,285			P	OC-Det			Subtotal	$ 26,203	$ 204,753
								$ 250,000,000	Per Mile						Fixed Price	$ 8	$ 8
															Total	$ 26,211	$ 204,761
															Per Mile	$ 140,000,000	$ 1,090,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.411		OC	Retained Fill, Walls Both Sides - 1 Tracks (10' Avg. Wall Ht)							OC	P	OC-Det					
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.700	sy	0.49	2	2	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 7
	31-14-13.23	A010	Rough Grading	3.700	sy	4.31	16	20	5.52		P	OC-Det		$ 1.00	$ 28.00	$ 4	$ 104
	31-22-16.10	A010	Finish Grading	2.800	sy	5.54	16	20	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 1	$ 17
	31-23-16.16	A010	Structural Excavation	0.400	cy	21.83	9	11	27.93		P	OC-Det		$ 4.00	$ 185.00	$ 2	$ 74
	31-23-23.14	A010	Structrual Backfill	0.200	cy	17.15	3	4	21.95		P	OC-Det		$ 10.00	$ 506.00	$ 2	$ 101
	31-23-23.13	A010	Embankment w/Haul & Compaction	9.400	cy	4.20	40	51	5.38		P	OC-Det		$ 10.00	$ 506.00	$ 94	$ 4,756
	31-25-13.10	A010	Erosion Control Allowance	1.000	lf	2.47	2	3	3.14		P	OC-Det				FP	FP
	32-31-13.20	A020	6 ft. Chain Link Fence, Wall Mounted	2.000	lf	26.77	54	67	33.51		P	OC-Det		$ 6.00	$ 140.00	$ 12	$ 280
	03-21-10.60	A010	Reinforcing Steel	114.910	lb	1.30	149	189	1.65		P	OC-Det	60 lb/cy	$ 0.60	$ 5.68	$ 69	$ 653
	03-30-53.40	A110	Structural Concrete, In Place, Footing	1.000	cy	361.82	362	457	456.87		P	OC-Det		$ 215.00	$ 700.00	$ 215	$ 700
	03-30-53.40	A120	Structural Concrete, In Place, Walls	0.900	cy	373.38	336	424	470.62		P	OC-Det		$ 230.00	$ 702.00	$ 207	$ 632
	33-41-13.60	A010	Trackway Drainage Allowance, Ballasted	1.000	lf	52.65	53	66	66.16		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	33-71-19.17	A050	Cable Duct, At-Grade Guideway	1.000	lf	36.17	36	46	45.59		P	OC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	OC-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	0.890	sy	49.76	44	55	61.97		P	OC-Det		$ 12.00	$ 238.80	$ 11	$ 213
			Retained Fill, Walls Both Sides - 1 Tracks (10' Avg. Wall Ht)	1.000	RF		1,125	1,420			P	OC-Det				Subtotal	$ 903	$ 9,635
								$ 7,000,000	Per Mile							Fixed Price	$ 7	$ 7
																Total	$ 910	$ 9,642
																Per Mile	$ 5,000,000	$ 60,000,000
10.08.412		OC	Retained Fill, Walls Both Sides - 1 Tracks (20' Avg. Wall Ht)							OC	P	OC-Det					
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.700	sy	0.49	2	2	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 7
	31-14-13.23	A010	Rough Grading	3.700	sy	4.31	16	20	5.51		P	OC-Det		$ 1.00	$ 28.00	$ 4	$ 104
	31-22-16.10	A010	Finish Grading	2.800	sy	5.54	16	20	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 1	$ 17
	31-23-16.16	A010	Structural Excavation	0.400	cy	21.83	9	11	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 2	$ 74
	31-23-23.14	A010	Structrual Backfill	0.200	cy	17.15	3	4	21.95		P	OC-Det		$ 10.00	$ 506.00	$ 2	$ 101
	31-23-23.13	A010	Embankment w/Haul & Compaction	18.900	cy	4.20	79	102	5.38		P	OC-Det		$ 10.00	$ 506.00	$ 189	$ 9,563
	31-25-13.10	A010	Erosion Control Allowance	1.000	lf	2.47	2	3	3.14		P	OC-Det				FP	FP
	32-31-13.20	A020	6 ft. Chain Link Fence, Wall Mounted	2.000	lf	26.77	54	67	33.50		P	OC-Det		$ 6.00	$ 140.00	$ 12	$ 280
	03-21-10.60	A010	Reinforcing Steel	253.840	lb	1.30	330	418	1.65		P	OC-Det	62 lb/cy	$ 0.60	$ 5.68	$ 152	$ 1,442
	03-30-53.40	A110	Structural Concrete, In Place, Footing	2.000	cy	361.83	724	914	456.88		P	OC-Det		$ 215.00	$ 700.00	$ 430	$ 1,400
	03-30-53.40	A120	Structural Concrete, In Place, Walls	2.100	cy	373.37	784	988	470.61		P	OC-Det		$ 230.00	$ 702.00	$ 483	$ 1,474
	33-41-13.60	A010	Trackway Drainage Allowance, Ballasted	1.000	lf	52.65	53	66	66.15		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	33-71-19.17	A050	Cable Duct, At-Grade Guideway	1.000	lf	36.17	36	46	45.60		P	OC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	OC-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	0.890	sy	49.76	44	55	61.94		P	OC-Det		$ 12.00	$ 238.80	$ 11	$ 213
			Retained Fill, Walls Both Sides - 1 Tracks (20' Avg. Wall Ht)	1.000	RF		2,155	2,721			P	OC-Det				Subtotal	$ 1,572	$ 16,773
								$ 14,000,000	Per Mile							Fixed Price	$ 7	$ 7
																Total	$ 1,579	$ 16,780
																Per Mile	$ 9,000,000	$ 90,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.413		OC	Retained Fill, Walls Both Sides - 1 Tracks (30' Avg. Wall Ht)							OC	P	OC-Det					
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	3.700	sy	0.49	2	2	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 7
	31-14-13.23	A010	Rough Grading	3.700	sy	4.31	16	20	5.52		P	OC-Det		$ 1.00	$ 28.00	$ 4	$ 104
	31-22-16.10	A010	Finish Grading	2.800	sy	5.54	16	20	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 1	$ 17
	31-23-16.16	A010	Structural Excavation	0.400	cy	21.83	9	11	27.93		P	OC-Det		$ 4.00	$ 185.00	$ 2	$ 74
	31-23-23.14	A010	Structrual Backfill	0.200	cy	17.15	3	4	21.95		P	OC-Det		$ 10.00	$ 506.00	$ 2	$ 101
	31-23-23.13	A010	Embankment w/Haul & Compaction	28.300	cy	4.20	119	152	5.38		P	OC-Det		$ 10.00	$ 506.00	$ 283	$ 14,320
	31-25-13.10	A010	Erosion Control Allowance	1.000	lf	2.47	2	3	3.15		P	OC-Det				FP	FP
	32-31-13.20	A020	6 ft. Chain Link Fence, Wall Mounted	2.000	lf	26.77	54	67	33.50		P	OC-Det		$ 6.00	$ 140.00	$ 12	$ 280
	03-21-10.60	A010	Reinforcing Steel	550.250	lb	1.30	715	906	1.65		P	OC-Det	62 lb/cy	$ 0.60	$ 5.68	$ 330	$ 3,125
	03-30-53.40	A110	Structural Concrete, In Place, Footing	5.260	cy	361.82	1,903	2,403	456.88		P	OC-Det		$ 215.00	$ 700.00	$ 1,131	$ 3,682
	03-30-53.40	A120	Structural Concrete, In Place, Walls	3.610	cy	373.37	1,348	1,699	470.61		P	OC-Det		$ 230.00	$ 702.00	$ 830	$ 2,534
	33-41-13.60	A010	Trackway Drainage Allowance, Ballasted	1.000	lf	52.65	53	66	66.15		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	33-71-19.17	A050	Cable Duct, At-Grade Guideway	1.000	lf	36.17	36	46	45.60		P	OC-Det		$ 3.50	$ 615.00	$ 4	$ 615
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	OC-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	0.890	sy	49.76	44	55	61.97		P	OC-Det		$ 12.00	$ 238.80	$ 11	$ 213
			Retained Fill, Walls Both Sides - 1 Tracks (30' Avg. Wall Ht)	1.000	RF		4,323	5,459			P	OC-Det				Subtotal	$ 2,892	$ 26,555
								$ 29,000,000	Per Mile							Fixed Price	$ 7	$ 7
																Total	$ 2,899	$ 26,562
																Per Mile	$ 16,000,000	$ 150,000,000
10.08.421		OC	Retained Fill, Walls Both Sides - 2 Tracks (10' Avg. Wall Ht)							OC	P	OC-Det					
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	5.600	sy	0.50	3	4	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 10
	31-14-13.23	A010	Rough Grading	5.600	sy	4.31	24	31	5.52		P	OC-Det		$ 1.00	$ 28.00	$ 6	$ 157
	31-22-16.10	A010	Finish Grading	4.700	sy	5.54	26	33	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 2	$ 28
	31-23-16.16	A010	Structural Excavation	0.400	cy	21.83	9	11	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 2	$ 74
	31-23-23.14	A010	Structrual Backfill	0.200	cy	17.15	3	4	21.95		P	OC-Det		$ 10.00	$ 506.00	$ 2	$ 101
	31-23-23.13	A010	Embankment w/Haul & Compaction	15.600	cy	4.20	66	84	5.38		P	OC-Det		$ 10.00	$ 506.00	$ 156	$ 7,894
	31-25-13.10	A010	Erosion Control Allowance	1.000	lf	2.47	2	3	3.13		P	OC-Det				FP	FP
	32-31-13.20	A020	6 ft. Chain Link Fence, Wall Mounted	2.000	lf	26.77	54	67	33.51		P	OC-Det		$ 6.00	$ 140.00	$ 12	$ 280
	03-21-10.60	A010	Reinforcing Steel	114.910	lb	1.30	149	189	1.65		P	OC-Det	60 lb/cy	$ 0.60	$ 5.68	$ 69	$ 653
	03-30-53.40	A110	Structural Concrete, In Place, Footing	1.000	cy	361.82	362	457	456.87		P	OC-Det		$ 215.00	$ 700.00	$ 215	$ 700
	03-30-53.40	A120	Structural Concrete, In Place, Walls	0.900	cy	373.38	336	424	470.64		P	OC-Det		$ 230.00	$ 702.00	$ 207	$ 632
	33-41-13.60	A010	Trackway Drainage Allowance, Ballasted	1.000	lf	52.65	53	66	66.13		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	33-71-19.17	A050	Cable Duct, At-Grade Guideway	2.000	lf	36.17	72	91	45.61		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.21		P	OC-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	0.890	sy	49.76	44	55	61.96		P	OC-Det		$ 12.00	$ 238.80	$ 11	$ 213
			Retained Fill, Walls Both Sides - 2 Tracks (10' Avg. Wall Ht)	1.000	RF		1,207	1,524			P	OC-Det				Subtotal	$ 971	$ 13,455
								$ 8,000,000	Per Mile							Fixed Price	$ 7	$ 7
																Total	$ 978	$ 13,462
																Per Mile	$ 6,000,000	$ 80,000,000

Unit Price Element	CSI No.	Item	Description	TO Qty		Dir Un $	Dir $	Bid $	Bid Unit $	Code1	P	Code2	Notes	Low $'s	High $'s	Low total	Hi Total
10.08.422		OC	Retained Fill, Walls Both Sides - 2 Tracks (20' Avg. Wall Ht)							OC	P	OC-Det					
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	5.600	sy	0.50	3	4	0.63		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 10
	31-14-13.23	A010	Rough Grading	5.600	sy	4.31	24	31	5.52		P	OC-Det		$ 1.00	$ 28.00	$ 6	$ 157
	31-22-16.10	A010	Finish Grading	4.700	sy	5.54	26	33	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 2	$ 28
	31-23-16.16	A010	Structural Excavation	0.400	cy	21.83	9	11	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 2	$ 74
	31-23-23.14	A010	Structrual Backfill	0.200	cy	17.15	3	4	22.00		P	OC-Det		$ 10.00	$ 506.00	$ 2	$ 101
	31-23-23.13	A010	Embankment w/Haul & Compaction	31.100	cy	4.20	131	167	5.38		P	OC-Det		$ 10.00	$ 506.00	$ 311	$ 15,737
	31-25-13.10	A010	Erosion Control Allowance	1.000	lf	2.47	2	3	3.14		P	OC-Det				FP	FP
	32-31-13.20	A020	6 ft. Chain Link Fence, Wall Mounted	2.000	lf	26.77	54	67	33.50		P	OC-Det		$ 6.00	$ 140.00	$ 12	$ 280
	03-21-10.60	A010	Reinforcing Steel	253.840	lb	1.30	330	418	1.65		P	OC-Det	62 lb/cy	$ 0.60	$ 5.68	$ 152	$ 1,442
	03-30-53.40	A110	Structural Concrete, In Place, Footing	2.000	cy	361.83	724	914	456.88		P	OC-Det		$ 215.00	$ 700.00	$ 430	$ 1,400
	03-30-53.40	A120	Structural Concrete, In Place, Walls	2.100	cy	373.37	784	988	470.61		P	OC-Det		$ 230.00	$ 702.00	$ 483	$ 1,474
	33-41-13.60	A010	Trackway Drainage Allowance, Ballasted	1.000	lf	52.65	53	66	66.16		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	33-71-19.17	A050	Cable Duct, At-Grade Guideway	2.000	lf	36.17	72	91	45.60		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	OC-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	0.890	sy	49.76	44	55	61.97		P	OC-Det		$ 12.00	$ 238.80	$ 11	$ 213
			Retained Fill, Walls Both Sides - 2 Tracks (20' Avg. Wall Ht)	1.000	RF		2,262	2,857			P	OC-Det				Subtotal	$ 1,700	$ 23,629
								$ 15,000,000	Per Mile							Fixed Price	$ 7	$ 7
																Total	$ 1,707	$ 23,636
																Per Mile	$ 10,000,000	$ 130,000,000
10.08.423		OC	Retained Fill, Walls Both Sides - 2 Tracks (30' Avg. Wall Ht)							OC	P	OC-Det					
	31-13-13.10	A010	Clearing & Grubbing Allowance, Level 1	5.600	sy	0.50	3	4	0.64		P	OC-Det		$ 0.04	$ 1.83	$ 0	$ 10
	31-14-13.23	A010	Rough Grading	5.600	sy	4.31	24	31	5.51		P	OC-Det		$ 1.00	$ 28.00	$ 6	$ 157
	31-22-16.10	A010	Finish Grading	4.700	sy	5.54	26	33	7.09		P	OC-Det		$ 0.35	$ 6.00	$ 2	$ 28
	31-23-16.16	A010	Structural Excavation	0.400	cy	21.83	9	11	27.95		P	OC-Det		$ 4.00	$ 185.00	$ 2	$ 74
	31-23-23.14	A010	Structrual Backfill	0.200	cy	17.15	3	4	21.90		P	OC-Det		$ 10.00	$ 506.00	$ 2	$ 101
	31-23-23.13	A010	Embankment w/Haul & Compaction	46.700	cy	4.20	196	251	5.38		P	OC-Det		$ 10.00	$ 506.00	$ 467	$ 23,630
	31-25-13.10	A010	Erosion Control Allowance	1.000	lf	2.47	2	3	3.14		P	OC-Det				FP	FP
	32-31-13.20	A020	6 ft. Chain Link Fence, Wall Mounted	2.000	lf	26.77	54	67	33.50		P	OC-Det		$ 6.00	$ 140.00	$ 12	$ 280
	03-21-10.60	A010	Reinforcing Steel	550.250	lb	1.30	715	905	1.65		P	OC-Det	62 lb/cy	$ 0.60	$ 5.68	$ 330	$ 3,125
	03-30-53.40	A110	Structural Concrete, In Place, Footing	5.260	cy	361.82	1,903	2,403	456.88		P	OC-Det		$ 215.00	$ 700.00	$ 1,131	$ 3,682
	03-30-53.40	A120	Structural Concrete, In Place, Walls	3.610	cy	373.37	1,348	1,699	470.61		P	OC-Det		$ 230.00	$ 702.00	$ 830	$ 2,534
	33-41-13.60	A010	Trackway Drainage Allowance, Ballasted	1.000	lf	52.65	53	66	66.16		P	OC-Det		$ 283.31	$ 1,483.80	$ 283	$ 1,484
	33-71-19.17	A050	Cable Duct, At-Grade Guideway	2.000	lf	36.17	72	91	45.60		P	OC-Det		$ 3.50	$ 615.00	$ 7	$ 1,230
	26-05-26.80	A010	Corrosion Control Allowance	1.000	lf	3.35	3	4	4.20		P	OC-Det				FP	FP
	32-06-10.10	A100	Site Restoration Allowance	0.890	sy	49.76	44	55	61.98		P	OC-Det		$ 12.00	$ 238.80	$ 11	$ 213
			Retained Fill, Walls Both Sides - 2 Tracks (30' Avg. Wall Ht)	1.000	RF		4,456	5,629			P	OC-Det				Subtotal	$ 3,082	$ 36,549
								$ 30,000,000	Per Mile							Fixed Price	$ 7	$ 7
																Total	$ 3,089	$ 36,556
																Per Mile	$ 17,000,000	$ 200,000,000

ATTACHMENT 3

Comments from AECOM Team

California High-Speed Train Project
Merced to Fresno Section
Basis of Estimate Review

AECOM CH2MHILL

Project Name:	California High-Speed Rail
Class Estimate:	Class 2
Estimated By:	John O'Reilly
Reviewed By:	Farid Nobari
Estimator Phone:	916.718.8916
Estimate Date:	12.23.2010
Produced by :	John O'Reilly/SAC – CH2M HILL Senior Estimator

1. Purpose of Estimate Review

The purpose of this task is to review the engineer's estimate provided by the Program Management Team (PMT), Parsons Brinckerhoff (PB) at 15% design and to provide comments (as applicable) on the scope, quantities, cost parameters, and methodology that were used.

2. General Project Description

The California High-Speed Train (HST) System, is planned to provide intercity, high-speed service on more than 800 miles of tracks throughout California, connecting the major population centers of Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County, and San Diego.

The draft cost estimate under review, covers Merced to Fresno section of the system, which is part of the Phase 1 projects, connecting San Francisco to Los Angeles via the Pacheco Pass and the Central Valley.

3. Items Reviewed

The cost estimate review is based on the following information provided by the PMT:

- Draft Unit Price Estimates - Aerial Structures - October 2010
- Draft Unit Price Estimates - Track and Maintenance – Facilities
- Supportive unit price listings dated 10-01-10

The following sub-section numbering corresponds to the unit price estimate report section of the above documents.

1.0 N/A

2.0 General Methodology

Scope – The Scope has been properly identified into unit price elements (UPEs) with the use of typical drawings and in some cases past rail experience. The cost elements have been defined by the Federal Transit Administration's (FTA's) standards. This approach is a standard basis of identifying the cost elements for the scope of work.

Quantities – The quantities have been generated and aligned with the UPEs from the typical drawings and dimensional information from the drawings. This approach is a standard cost estimating practice at 15% design.

Cost – The UPEs have been incorporated into the Timberline Estimating Software in a well-thought-out manner. The approach being used is standard practice with bottoms-up estimating. The unit cost have been review and appear to be reasonable.

3.0 Report Format

The report format was well thought out and highlights the general methodology of the project scope, quantities, cost, and general assumptions. The estimate backup has been provided with the appropriate assumptions documented in developing the scope, quantities, and cost estimate.

4.0 Unit Price Element Parameters

Quantities – As mentioned in the general methodology section of the report, the quantities have been generated by standard practices and means.

Unit Costs – The unit costs have been developed utilizing the Timberline Estimating Software, which is tied to a national means cost database. This estimating software allows estimating to be done using a bottoms-up method. Typically, the national means database does run +/- of a typical contractor's bottoms-up estimates where material, equipment, and labor have been crewed up. Our estimation practice applies an estimate accuracy range based on the amount of design that has been completed. In this case, the estimate is based on 15% design and would have an accuracy range of -10% to +15%.

Labor Rates – Craft labor rates have been used using standard practices. The raw labor rates, fringe benefits, insurance, and taxes have been combined into a composite labor rate for union work in the Los Angeles area. The actual composite labor rate that is being used was not referenced in the report and cannot be confirmed for accuracy. For Merced-Fresno section, more locally representative labor rate may be considered. Note that some crafts will be imported from more urbanized regions.

Equipment Rates – Hourly equipment rental and operating rates were estimated using commercially available equipment rates published by R,S. Means. Typically, these rates are going to be +/- of a typical contractor's inside and outside rental rates. The industry standard is to use 80% of the blue book equipment rental rates. This can be covered with the estimate accuracy range that is mentioned in the Recommendations section below.

Material Prices – Permanent and consumable materials were estimated using commercially available equipment rates published by R.S. Means. Typically, these rates are going to be +/- of a typical contractor's quoted materials during the closing process of an estimate. Significant implications can result on a project of this size if material pricing methods are not consistent. Potential discrepancies in pricing the material can be covered with the estimate accuracy range that is mentioned in the Recommendations section below.

Contractor's Overhead, Indirect, and Profit

The list of markup allowances and taxes have been reviewed and seem to be reasonable except for the Markup Allowance for profit. Typically, a range exists from 10% to 18%

for major design-build projects of this type with a mean average of 13%. See Recommendations below for further details.

4. Assumptions and Reference Drawings

All documented assumptions appear to be reasonable except for the work-week schedule and embankment material. Our recommendation is to schedule the work week based on 5/10's as the typical work week. The embankment material assumptions are aggressive in nature with some risk. The risks rise from assuming that the excavated material would be of good engineering quality to be used for new embankments. Our recommendation would be to assume much lower supply of embankment fills to be from excavated material, and that a majority of the fill (up to 60 to 70%) will be import material. See Recommendations below for more details.

5. Escalation Rate

The current estimate does not include any escalation. We recommend the following **escalation factors** for the first quarter of 2011:

- Subcontractors— 4 % per year
- Composite rate— 3.85 % per year
- Labor— 3 % per year
- Materials and Equipment— 4 % per year
- Diesel Fuel—$3.25 per gallon
- Gasoline—$3.00 per gallon

6. Market Conditions

The current market conditions are drastically impacting the construction market across the country. This is based upon recent bids and comparisons with Engineer's Estimates. Bids are coming in between 10% to 20%, and even 30%, lower than the current engineer's estimates. Despite the estimator's best practices and adjustments, bids are being driven by current market conditions. A detailed analysis of local market conditions should be made; this could be performed by a review of upcoming and current similar projects around the region of this project site. Market conditions include the following:

- Busy contractors
- Contractors selectively bidding jobs
- Contractors selectively choosing which owners they want to work for
- Premium wages to keep skilled workers and management staff
- Availability of crafts/trades
- Immigration impacts and uncertainty
- Abnormal fuel impacts and uncertainty (Oil = $88/barrel; gas = $3.20/gal)
- Abnormal material impacts of the last two years; inflation is already starting to trend upward and will impact major projects in the next several years

7. Estimate Classification

This cost estimate is considered a Budget Level or Class 3 estimate as defined by the American Association of Cost Engineering (AACE). It is considered to be accurate to +15% to –10%, based upon a 15% design deliverable.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The client should be cautioned that such prices are highly subject to variation as a result of market conditions.

8. Cost Resources

The following is a list of the various cost resources used in developing the cost estimate that we agree was a good basis of estimate:

- R.S. Means
- Vendor quotes on equipment and materials where appropriate
- Estimator's judgment

Labor unit prices reflect a burdened rate, including workers' compensation, unemployment taxes, fringe benefits, and medical insurance.

9. Sales Tax

Sales tax has been reviewed and confirmed at 9.25%.

10. Recommendations

Our recommendations are as follows:

- Contingency should be included for quantity creep, design change, parametrical calculated quantities, and assumed quantities based on past rail experience. Our recommended percentage to capture the quantity risk is a range from 8% to 15% contingency, with 10% being recommended for this project for quantity risk.
- A composite labor rate should be included within the assumptions for reference and to confirm the accuracy of the rate being used. A disconnect of only a few dollars can add up to tens of millions of dollars being associated with the project cost.
- An estimated accuracy range should be included after all direct, indirect, markups, contingency, and escalation have been completed. Our estimation policy for a project of this size at 15% design would be to insert a -10% to 15% accuracy range.
- The recommendation for contractor profit would be a mean average of 13%.
- A craft work week should be estimated using 5/10's.
- The embankment material assumption is a little aggressive. We recommend using 60% as import material for the embankment in lieu of all embankment material coming from excavated material onsite.

Low Range	Estimate Range	High Range
-10%		+15%
$4,639,429,039	**Total $5,154,921,155**	$5,928,159,328

ATTACHMENT 4

Comments from HMM Team

California High-Speed Train Project

Palmdale to Los Angeles

PEER REVIEW OF PROTOTYPICAL TUNNEL UNIT COSTS

Prepared by: _____ _____
Ken Fiorentino Date

Checked by: _____ _____
Mike Wongkaew, PhD, PE, SE Date

Reviewed by: _____ _____
John Hawley, PE Date

Approved by: _____ _____
Dan Tempelis, PE Date

Revision	Date	Description
0	November 2010	Issued

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TABLE OF CONTENTS

TABLES

ABBREVIATIONS / ACRONYMS

Authority ..... California High-Speed Rail Authority
D&B ..... Drill and Blast
EPB ..... Earth Pressure Balance tunnel boring machine
HMM ..... Hatch Mott MacDonald
HST ..... High-Speed Train
ID ..... Internal Diameter
LF ..... Linear Foot
OD ..... Outer Diameter
RF ..... Route Foot
RH ..... Roadheader
SEM ..... Sequential Excavation Method
TBM ..... Tunnel Boring Machine
UCC ..... Unit Cost Category

1.0 EXECUTIVE SUMMARY

The purpose of this memorandum is to provide a limited peer review of Unit Price Estimates ($/Route Foot and $/Route Mile) for 27 categories of prototypical tunnels for the California High-Speed Train Project (CHSTP) summarized in Table 1 below.

Thirty two documents were provided for our review on November 3, 2010, including 31 HeavyBid® Cost Reports along and Prototypical Tunnel Unit Costs Memorandum. We reviewed these documents as provided; no independent estimates were performed as part of this review. General and specific comments are provided in the body of this memorandum.

Our aim is to provide a brief note giving general opinion on the cost estimating methodology and rates of various tunnel unit cost categories, identifying particularly rates where we see issues and suggesting adjustments, redefinitions and recommendations for future work.

It is our general opinion that the proposed Unit Price Estimates quoted in Table 1 below are in the reasonable ranges, given the exclusions and assumptions adopted in the cost estimating approach and despite the pluses and minuses to be reconciled as a result of incorporation of our comments

The only exceptions are the high costs of Drill & Blast Tunnels with Type IV Support (UCC #8, #12 and #16), which more than double the costs of Drill & Blast Tunnels of the same size but with Type I Support (UCC #5, #9 and #13, respectively). We recommend further examination to identify the cause of this high contrast, which we did not find when examining the cost differentials for SEM or RH tunnels with Type IV versus Type I support.

Table 1: Summary of Unit Price Estimates for Prototypical Tunnels

Unit Cost Categories		$/Route Foot[1] ($/Route Mile or $/Cross Passage)	Our General Opinion on Unit Price
TBM Single-Track Twin Tunnels			
1	TBM Single Track, Twin Tunnel, 30-ft ID, Unpressurized Machine in Hard Rock	$23,000 ($121,440,000)	Within reasonable range
2	TBM Single Track, Twin Tunnel, 30-ft ID, Slurry Machine in Hard Rock	$34,000 ($179,520,000)	Within reasonable range
3	TBM Single Track, Twin Tunnel, 30-ft ID, EPB in Soft Ground	$30,000 ($158,400,000)	Within reasonable range

[1] Source: Table 6 of Prototypical Tunnel Unit Costs Memorandum, Final Draft, October 2010 prepared by PMT

Unit Cost Categories		$/Route Foot[1] ($/Route Mile or $/Cross Passage)	Our General Opinion on Unit Price
TBM Double-Track Tunnel			
4	TBM Double Track Tunnel, 50-ft ID, Slurry Machine in Soft Ground	$57,000 ($300,960,000)	Within reasonable range
4B	TBM Double Track Tunnel, 40-ft ID, Slurry Machine in Soft Ground	$43,000 ($227,040,000)	Within reasonable range
Hard Rock - D&B Single-Track Twin Tunnels			
5	D&B Single Track, Twin Tunnel, 30-ft ID in Hard Rock, Support Type I	$39,000 ($205,920,000)	Within reasonable range
8	D&B Single Track, Twin Tunnel, 30-ft ID in Hard Rock, Support Type IV	$88,000 ($464,640,000)	High, as compared to UCC #5
Hard Rock - D&B Double-Track Tunnel			
9	D&B Double Track Tunnel, 40-ft ID in Hard Rock, Support Type I	$28,000 ($147,840,000)	Within reasonable range
12	D&B Double Track Tunnel, 40-ft ID in Hard Rock, Support Type IV	$69,000 ($364,320,000)	High, as compared to UCC #9
13	D&B Double Track Tunnel, 50-ft ID in Hard Rock, Support Type I	$44,000 ($232,320,000)	Within reasonable range
16	D&B Double Track Tunnel, 50-ft ID in Hard Rock, Support Type IV	$92,000 ($485,760,000)	High, as compared to UCC #13
Soft Ground - SEM Single-Track Twin Tunnels			
17	SEM Single Track, Twin Tunnel, 30-ft ID in Soft Ground, Support Type I	$71,000 ($374,880,000)	Within reasonable range; a bit conservative
20	SEM Single Track, Twin Tunnel, 30-ft ID in Soft Ground, Support Type IV	$86,000 ($454,080,000)	Within reasonable range

Unit Cost Categories		$/Route Foot[1] ($/Route Mile or $/Cross Passage)	Our General Opinion on Unit Price
Soft Ground - SEM Double-Track Tunnel			
21	SEM Double Track Tunnel, 40-ft ID in Soft Ground, Support Type I	$51,000 ($269,280,000)	Within reasonable range
24	SEM Double Track Tunnel, 40-ft ID in Soft Ground, Support Type IV	$58,000 ($306,240,000)	Within reasonable range
25	SEM Double Track Tunnel, 50-ft ID in Soft Ground, Support Type I	$75,000 ($396,000,000)	Within reasonable range
28	SEM Double Track Tunnel, 50-ft ID in Soft Ground, Support Type IV	$85,000 ($448,800,000)	Within reasonable range
Soft Rock - RH Single-Track Twin Tunnels			
29	RH Single Track, Twin Tunnel, 30-ft ID in Soft Rock, Support Type I	$45,000 ($237,600,000)	Within reasonable range
32	RH Single Track, Twin Tunnel, 30-ft ID in Soft Rock, Support Type IV	$52,000 ($274,560,000)	Within reasonable range
Soft Rock - RH Double-Track Tunnel			
33	RH Double Track Tunnel, 40-ft ID in Soft Rock, Support Type I	$34,000 ($179,520,000)	Within reasonable range
36	RH Double Track Tunnel, 40-ft ID in Soft Rock, Support Type IV	$47,000 ($248,160,000)	Within reasonable range
37	RH Double Track Tunnel, 50-ft ID in Soft Rock, Support Type I	$55,000 ($290,400,000)	Within reasonable range
40	RH Double Track Tunnel, 50-ft ID in Soft Rock, Support Type IV	$76,000 ($401,280,000)	Within reasonable range

Unit Cost Categories		$/Route Foot[1] ($/Route Mile or $/Cross Passage)	Our General Opinion on Unit Price
Cross Passage			
41	D&B Cross Passage in Rock	$28,000 ($924,000 EA)	Within reasonable range
43	RH Cross Passage in Soft Rock	$25,000 ($825,000 EA)	Within reasonable range
44	SEM Cross Passage in Soft Ground	$33,000 ($1,089,000 EA)	Within reasonable range
45	SEM Cross Passage in Soft Ground, Including Jet Grout	$84,000 ($2,772,000 EA)	Within reasonable range

2.0 REVIEW METHODOLOGY

Thirty two documents identified in Table 2 below were provided for our review on November 3, 2010. These include the memorandum summarizing the prototypical tunnel unit costs and 31 HeavyBid® cost reports for various direct and indirect cost categories.

Considering the large volume of documents to be reviewed (1020 pages total), diversity of tunnel construction methods and tunnel sizes (27 categories total) and short time given to perform this task, only a limited review of the documents could be performed. We reviewed the documents as provided, and no independent estimates were performed as part of this review.

Table 2: List of Documents Reviewed

No.	Title	Date	Pages
Memorandum			
1	Prototypical Tunnel Unit Costs Memorandum – Final Draft	10/27/10	56
HeavyBid® Direct Cost Report for TBM Tunnels			
2	HeavyBid® Direct Cost Report for Unit Cost Category #1 – TBM Single Track, Twin Tunnel, 30-ft ID, Unpressurized Machine in Hard Rock	5/21/10	71
3	HeavyBid® Direct Cost Report for Unit Cost Category #2 – TBM Single Track, Twin Tunnel, 30-ft ID, Slurry Machine in Hard Rock	5/21/10	57
4	HeavyBid® Direct Cost Report for Unit Cost Category #3 – TBM Single Track, Twin Tunnel, 30-ft ID, EPB in Soft Ground	5/21/10	53
5	HeavyBid® Direct Cost Report for Unit Cost Category #4 – TBM Double Track Tunnel, 50-ft ID, Slurry Machine in Soft Ground	5/21/10	37
6	HeavyBid® Direct Cost Report for Unit Cost Category #4B – TBM Double Track Tunnel, 40-ft ID, Slurry Machine in Soft Ground	5/21/10	24
HeavyBid® Direct Cost Report for D&B Tunnels			
7	HeavyBid® Direct Cost Report for Unit Cost Category #5 – D&B Single Track, Twin Tunnel, 30-ft ID in Hard Rock, Support Type I	10/5/10	18
8	HeavyBid® Direct Cost Report for Unit Cost Category #8 – D&B Single Track, Twin Tunnel, 30-ft ID in Hard Rock, Support Type IV	10/6/10	78
9	HeavyBid® Direct Cost Report for Unit Cost Category #9 – D&B Double Track Tunnel, 40-ft ID in Hard Rock, Support Type I	10/5/10	17

No.	Title	Date	Pages
10	HeavyBid® Direct Cost Report for Unit Cost Category #12 – D&B Double Track Tunnel, 40-ft ID in Hard Rock, Support Type IV	10/6/10	41
11	HeavyBid® Direct Cost Report for Unit Cost Category #13 – D&B Double Track Tunnel, 50-ft ID in Hard Rock, Support Type I	10/6/10	19
12	HeavyBid® Direct Cost Report for Unit Cost Category #16 – D&B Double Track Tunnel, 50-ft ID in Hard Rock, Support Type IV	10/6/10	45
HeavyBid® Direct Cost Report for SEM Soft Ground Tunnels			
13	HeavyBid® Direct Cost Report for Unit Cost Category #17 – SEM Single Track, Twin Tunnel, 30-ft ID in Soft Ground, Support Type I	10/6/10	36
14	HeavyBid® Direct Cost Report for Unit Cost Category #20 – SEM Single Track, Twin Tunnel, 30-ft ID in Soft Ground, Support Type IV	10/6/10	72
15	HeavyBid® Direct Cost Report for Unit Cost Category #21 – SEM Double Track Tunnel, 40-ft ID in Soft Ground, Support Type I	10/6/10	35
16	HeavyBid® Direct Cost Report for Unit Cost Category #24 – SEM Double Track Tunnel, 40-ft ID in Soft Ground, Support Type IV	10/6/10	36
17	HeavyBid® Direct Cost Report for Unit Cost Category #25 – SEM Double Track Tunnel, 50-ft ID in Soft Ground, Support Type I	10/6/10	36
18	HeavyBid® Direct Cost Report for Unit Cost Category #28 – SEM Double Track Tunnel, 50-ft ID in Soft Ground, Support Type IV	10/6/10	40
HeavyBid® Direct Cost Report for RH Soft Rock Tunnels			
19	HeavyBid® Direct Cost Report for Unit Cost Category #29 – RH Single Track, Twin Tunnel, 30-ft ID in Soft Rock, Support Type I	10/6/10	22
20	HeavyBid® Direct Cost Report for Unit Cost Category #32 – RH Single Track, Twin Tunnel, 30-ft ID in Soft Rock, Support Type IV	10/6/10	38
21	HeavyBid® Direct Cost Report for Unit Cost Category #33 – RH Double Track Tunnel, 40-ft ID in Soft Rock, Support Type I	10/6/10	26
22	HeavyBid® Direct Cost Report for Unit Cost Category #36 – RH Double Track Tunnel, 40-ft ID in Soft Rock, Support Type IV	10/6/10	23
23	HeavyBid® Direct Cost Report for Unit Cost Category #37 – RH Double Track Tunnel, 50-ft ID in Soft Rock, Support Type I	10/6/10	26

No.	Title	Date	Pages
24	HeavyBid® Direct Cost Report for Unit Cost Category #40 – RH Double Track Tunnel, 50-ft ID in Soft Rock, Support Type IV	10/6/10	23
HeavyBid® Direct Cost Report for Cross Passages			
25	HeavyBid® Direct Cost Report for Unit Cost Category #41 – D&B Cross Passage in Rock	10/12/10	12
26	HeavyBid® Direct Cost Report for Unit Cost Category #43 – RH Cross Passage in Soft Rock	10/12/10	12
27	HeavyBid® Direct Cost Report for Unit Cost Category #44 – SEM Cross Passage in Soft Ground	10/12/10	13
28	HeavyBid® Direct Cost Report for Unit Cost Category #45 – SEM Cross Passage in Soft Ground, Including Jet Grout	10/12/10	14
HeavyBid® Indirect Cost Report			
29	HeavyBid® Indirect Cost Report for TBM Tunnel	10/20/10	10
30	HeavyBid® Indirect Cost Report for Drill & Blast Tunnel	10/21/10	10
31	HeavyBid® Indirect Cost Report for SEM Tunnel	10/21/10	10
32	HeavyBid® Indirect Cost Report for Road Header Tunnel	10/21/10	10
		Total	**1020**

3.0 OUR UNDERSTANDING OF UNIT COST ESTIMATING APPROACH

It is our understanding that the prototypical unit costs were prepared by the CHSTP Program management Team (PMT) and are intended for use in the development of programmatic-level cost estimates and to support future detail cost estimates at a regional level for California High-Speed Train Project. Some general assumptions behind the unit costs include:

- All the TBM Tunnel Estimates were developed assuming 10,560 LF (2 mi) long tunnel
- All the Conventional Tunnel Estimates (Drill & Blast for hard rock, SEM for soft ground, or Road Header for soft rock) were developed assuming 1,000 LF (0.19 mi) long tunnel

- Due to the absence of specific geotechnical information, two support classes, Class I and Class IV, were assumed for Conventional Tunnel Estimates; Class I was considered for Good Ground and Class IV was considered for Poor Ground
- All estimates are for the excavation, temporary support of excavation, final tunnel lining. For double-track tunnels, the estimates include reinforced concrete center wall separating the two tracks. First-stage track concrete and walkway are included only in UCCs #1, #4, #4B and#5.[2]
- Estimates exclude site work, utilities, mobilization, demobilization, financing, bonds, escalation, contingencies, surveying and personnel mobilization (Source: Section 4.0 of the Prototypical Tunnel Unit Costs Memorandum)

4.0 GENERAL OPINION AND RECOMMENDATION

1. With the exception of utilities and contingencies, which are accounted for separately in the cost estimating spreadsheet used by PMT, the exclusions identified in the last bullet above represent major components that contractors would have included in their cost. These costs further depend on the method of tunneling. As such, we caution that the proposed Programmatic Unit Price Elements do not directly relate to contractor's bid price. Adjustments, which could be significant, to the proposed unit prices to account for these excluded items will be required prior to incorporation of unit prices into Programmatic Level Cost Estimates. Further, there is a risk that these unit prices could be misinterpreted by casual users who may not be familiar with the assumptions, exclusions and limitations inherent in these numbers.

2. Nevertheless, we find the proposed Unit Price Elements very useful for the purpose of comparing relative costs of various tunnel construction methods, subject to general and detail comments below.

3. We understand the absence of geotechnical information at specific tunnel sites, and as such recognize that it was necessary to assume conservative productivity rates. Due to this difficulty, we refrain generally from commenting on productivity at this stage of project development, unless we find the rates to be too optimistic or too conservative.

4. We recommend the following adjustments, which would increase equipment and labor costs:

    a. Plant and equipment hourly rates used in the estimates are somewhat low. (For comparison, we used the ownership and operating costs data in EquipmentWatch® Cost Reference Guide.)

    b. Recommend adding a Plant & Equipment purchase / salvage / assembly spreadsheet for all major equipment and plants.

    c. Travel time within the tunnels from the dry house to the heading and back should be added, a union requirement.

[2] It is unclear how the cost of first-stage track concrete and walkway will be captured for other UCCs. The accompanying sketches in Appendix B of Prototypical Tunnel Unit Costs Memorandum do not show these elements and the HeavyBid® Cost Reports do not appear to include these elements.

d. Should add cost for working through lunch and eating on the fly

e. Should add cost for major maintenance days or shifts at least once each week

f. Should adjust the pay hours and rates to reflect the travel time and working through lunch, all that time is overtime.

5. The documents would benefit from additional coordination and QA/QC review. As illustrated by examples in the section that follows, mining rates and conceptual excavation support designs stated in the Prototypical Tunnel Unit Costs Memorandum should be reconciled with those used in HeavyBid® Direct Cost Reports. Also, there are elements, such as crews or equipments, inserted in HeavyBid® Direct Cost Reports that may not be compatible with the tunneling method or construction activity being estimated. While we recognize that most of the items to be reconciled may not result in a significant change in the unit prices, which is our ultimate objective, eliminating these minor inconsistencies would strengthen the defensibility of the Unit Price Estimates.

6. Overall, given the exclusions and assumptions adopted in the cost estimating approach, and despite the pluses and minuses to be reconciled as a result of additional QA/QC review of the cost estimates and incorporation of our comments, it is our general opinion that the individual Unit Price Estimates ($/Route Foot) shown in Table 6 of the Prototypical Tunnel Unit Costs Memorandum are in the reasonable ranges. The only exceptions are the high costs of Drill & Blast Tunnels with Type IV Support (UCC #8, #12 and #16), which more than double the costs of Drill & Blast Tunnels of the same size but with Type I Support (UCC #5, #9 and #13, respectively). We recommend further examination to identify the cause of this high contrast, which we did not find in when looking at the cost differentials for SEM or RH tunnels with Type IV versus Type I support.

7. Due to limited time, we did not review the cross passage cost estimates (UCCs #41, #43, #44 and #45) in detail. Cross passages generally represent a small fraction of overall tunnel cost. Nevertheless, based on our experience on similar projects, it is our general opinion that the Unit Price Estimates ($/LF) for cross passages shown in Table 6 of the Prototypical Tunnel Unit Costs Memorandum are in the reasonable range. For 33-ft long by 14 ft ID typical cross passage dimensions, the cost per foot translates to $0.8 to $2.8 millions for cross passage in rock and in soft ground requiring jet grouting for ground improvement, respectively.

5.0 SPECIFIC RECOMMENDATION

Due to the short time frame, we were unable to review all 31HeavyBid® cost reports. We focused our effort on reviewing the Prototypical Tunnel Unit Costs Memorandum and at least one HeavyBid® cost report for each tunneling method (TBM, D&B, SEM, and RH). The recommendations below are intended to help with the QA/QC process suggested above and with future improvement of the estimates as the project further develops.

5.1 Prototypical Tunnel Unit Costs Memorandum

We find the Memo to be clearly written, and the advance rates and conceptual design of tunnel excavation sequence and supports to be reasonable given the limited geotechnical data and considering the early stage of project development. Below are minor suggestions for consideration:

1. Page 5, Second Para.: The reference to European experience, while may be viewed as factual by some, seems out of context and it is unclear whether this has been a consideration in the Unit Price Estimates. Suggest omitting the sentence.

2. Page 9, Section 6.5, Line 2: Agree that TBM delivery cost should be included; however, this has not been consistently applied to all HeavyBid® Direct Cost Reports for all TBM tunnels.

3. Page 9, Section 6.5, Table 5: TBM Supply Costs for UCC 1 through 3 are for single TBM while Unit Price Estimates were based on two TBMs. Suggest reporting the TBM Supply Costs for two TBMs for consistency and for comparison with UCC 4 and 4B.

4. Page 9, Section 6.7, Line 4: Please check the excavation method of UCC 41 and 43 as they may have been switched.

5. Page 12, Table 6: Advance rate of UCC 2 (30-ft ID Slurry TBM in hard rock) of 20 ft/day seems too conservative.

6. Page 15: The backfill below the concrete invert slab has not been identified and does not appear to be included in the HeavyBid® Direct Cost Report.

7. Page 38, Appendix B, UCC 1: Mining rate of 26 LF/day and lining rate of 20 LF/day are too conservative and not coordinated with Table 6 on Page 12.

8. Page 38, Appendix B, UCC 1: Swell factor of 1.5 is somewhat low. Suggest 1.8 (Source: Robbins)

9. Page 51, Appendix C: TBM utilization seems a bit conservative. It is unclear how this information is reflected in the HeavyBid® estimates.

10. Page 51, Appendix C: Tunnel outside diameters seems to refer to the concrete lining. The TBM excavated diameters will be larger.

11. Page 51, Appendix C: For UCC 1 through 3, quantities appear to be for one tunnel instead of two.

12. Page 51, Appendix C: For UCC 4, the concrete and reinforcement quantities do not coordinate with HeavyBid® estimate.

13. Page 51, Appendix C: the cost of concrete liner for UCC 2 and 3 seems high, almost twice of UCC 1 which we feel is a more reasonable number. Since the liners for UCC 1 through 3 have similar thickness and reinforcement ratios, the difference seems too drastic and warrants a closer examination.

5.2 UCC#1 – TBM Single Track, Twin Tunnel, 30-ft ID, Unpressurized Machine in Hard Rock

1. Bid Item 20021:
    a. Page 3 Activity ASMTBM is for a 21 FT TBM. This should be 33.5 ft OD TBM.
    b. Page 25, Activity 20215B, tail shield and erector ring disassembly are included; however, these are not applicable to main beam TBM and cast-in-place concrete lining assumed for this UCC.
2. Bid Item 20031, Page 26: 21FT TBM was noted, instead of 33.5 ft OD for this UCC. Also, it is unclear why the total crew hours for disassembling the TBM is the same as that used for assembling the TBM in Activity 20215B.
3. Bid Item 20225 on Page 32
    a. Robbins 24'-6" shown instead of 33.5 ft TBM; and at 38 % the math does not calculate.
    b. Suggest verifying the validity of applying the same cutter replacement unit cost of $4.50 per loose cubic yard of excavated material for all TBM tunnel UCCs (hard rock and soft ground). Also, please verify whether the unit cost data should be per bank cubic yard or loose cubic yard.
    c. There is no allowance for Travel Time from the Dry House to the Tunnel Heading.
    d. 22.5 working hours shown, meaning there is no one at the tunnel heading for 0.5 hours per shift and 1.5 hours per day. There should always be a crew at the tunnel heading during a standard work day. These hours should be adjusted to reflect a 24 hour work day plus travel time.
4. No line item for muck disposal; not consistent with other UCCs.
5. Bid Item 20235 on Pages 45-46: including both steel fibers (at about 80#/CY) and rebars (at about 200#/CY) seems redundant. Bid Item 20240 on Page 48: 938,667 LB of rebars represent about 270#/CY of concrete, which seems high and not coordinated with the assumptions in Appendix B of Prototypical Tunnel Unit Costs Memorandum.

5.3 UCC #2 -- TBM Single Track, Twin Tunnel, 30-ft ID, Slurry Machine in Hard Rock

1. Bid Item 20011, Page 1: Should include cost of slurry pipe.
2. Bid Item 20021, Page 3-4:
    a. Front support, side supports, rear supports, gripper and main beam are not applicable for slurry TBM. Activities associated with these items should be removed.
    b. 21 ft TBM noted, instead of 33.5 ft.
    c. The crew hours for assembling slurry TBM (568 hours) should be different than the crew hours for assembling a main beam TBM in UCC #1.
3. Activity 20215C, Page 3-6: Gripper walls are not applicable for slurry TBM.
4. Activity 20215H, Page 8: D&B Tunnel Service Crew shown; not applicable for Slurry TBM.
5. Activity 20220A, Page 9: Conveyor shown; unclear how this is applicable to slurry TBM.
6. Activity 20220B, Page 10: Unclear where pea gravel ballast is used for slurry TBM with precast concrete segmental tunnel lining.
7. Activity 20220G, Page 12 and Activity 20021, Page 14: Muck hopper and muck transfer belt shown; not applicable for slurry TBM where muck is transported in slurry return pipe.

8. Activity 20220A, Page 36: PCC lining cost of $58 Millions seems too high when compared to $29.9 cast-in-place lining for UCC #1, which seems reasonable. Please check.
9. No line item for muck disposal; not consistent with other UCCs.
10. Activities 20240D and 20240F, Page 43: quantities of haunch concrete and rebars not coordinated with those shown on Appendix C of Prototypical Tunnel Unit Costs Memorandum.

5.4 UCC #3 – TBM Single Track, Twin Tunnel, 30-ft ID, EPB in Soft Ground

1. Bid Item 20021:
    a. Front support, side supports, rear supports, gripper and main beam are not applicable for EPB TBM and activities associated with these items should be removed.
    b. Page 4 ASMTBM is for a 21 FT TBM for Tunnel #1. This should be 33.5 ft OD TBM.
    c. Page 5 FMGRIP crew has a Drill Jumbo & a Wagner ST 3.5 LHD. These are not applicable for EPB TBM.
    d. Page 8 Activity 20215H and Page 20220M, Drill & Blast Shaft Service Crew was noted. This is not applicable for EPB TBM operation.
2. Page 35 Bid Item 20225
    a. Activity 20225B shows 33.5' TBM; however, the crew has a 24'-6" Robbins TBM at 38%. The value of $301,777 for the Robbins at 38% does not calculate. It is unclear what 38% is for. Take 38% of 6,050.67 Hrs = 2,299.25 x $375 = $862,220.47 not $301,777. This is repeated on page 44 for Tunnel #2.
    b. The major equipment operating hours should be less than the crew hours due to the loss of efficiency with the TBM.
    c. There is no allowance for travel time from the dry house to the heading.
3. Page 38 Activity 20235A
    a. Concrete Crew shown with a Wagner ST3.5 and a concrete pump for 150 CY pour of Invert. Suggest instead: using 5" slick line and pump 5280 LF from each end of the tunnel portals; setting 2 each invert screeds at the center of the tunnel and pour out to each portal; setup a concrete screed attached to the precast segments with rail brackets and run light rail on these brackets to hang the screed from.
    b. This concrete crew has Crane Oiler and Electricians. There is no crane in the operation and it is unclear why the crane or the electricians are required. There are Concrete Forms for the Cavern Walls in Activity 20240B, however, we could not locate the invert screed or invert forming system.

5.5 UCC #4 – TBM Double Track Tunnel, 50-ft ID, Slurry Machine in Soft Ground

1. Activity 20210, Page 1:
    a. Based on the sketch shown on Page 15 of Prototypical Tunnel Unit Costs Memorandum, the TBM outside diameter will be 55.33 ft. 54 ft is OD of lining.
    b. No Freight cost in this item. Freight cost is included in TBM Purchase items for other UCCs. Should be consistent.

2. Activity 20215A, Page 2: Unclear why the cost to receive and offload 54 ft TBM is less than that for one 33.5 ft TBM in UCC #2.
3. Activity 20215B, Pages 2-3:
    a. Front support, side supports, rear supports, gripper and main beam are not applicable for slurry TBM and activities associated with these items should be removed.
    b. Unclear why the cost to assemble 54 ft slurry TBM is less than that for one 33.5 ft TBM in UCC #2.
4. Activity 20215C, Pages 3-5: Gripper walls are not applicable for slurry TBM.
5. Activity 20215D, Page 5: Invert mud slab for 54 ft slurry TBM should be larger than that for one 33.5 ft TBM in UCC #2.
6. Activity 20215H, Page 7: D&B Tunnel Service Crew shown; not applicable for slurry TBM.
7. Activities 20217A-C, Page 8: These activities are related to conveyor belt, which is not applicable for slurry TBM.
8. Activities 20220A and 20220C-F, Pages 9-11: Unclear why the costs for these activities, which are for 54 ft slurry TBM are less than those shown for one 33.5 ft TBM in UCC #2.
9. Activity 20220B, Page 9: Unclear where pea gravel ballast is used for slurry TBM with precast concrete segmental tunnel lining.
10. Activity 20220G, Pages 11-12 and Activity 20220H, Page 12: Muck hopper and muck transfer belt shown; not applicable for slurry TBM where muck is transported in slurry return pipe.
11. Activity 20225B, Page 17 shows mining rate of 5.86 ft per shift. This is low, and inconsistent with 36 LF/Day assumed in Table 6 of Prototypical Tunnel Unit Costs Memorandum. We feel 36 LF/Day is achievable, based on our experience with planning for 56 ft TBM in Seattle.
12. No line item for muck disposal; not consistent with other UCCs.
13. Activity 20235D on Pages 20: inclusion of steel fibers seems redundant with rebars in Activity 20235A.
14. Activities 20235A and 20235L: Rebars are included in both activities, please confirm that we need both.
15. Activities 20240A and 20240D on Pages 24-25: inclusion of both steel fibers (8.1 million pounds) and rebars (4.4 million pounds) seems redundant.
16. Activity 20215B, Pages 32-33: Front support, side supports, rear supports, gripper and main beam are not applicable for slurry TBM and activities associated with these items should be removed.
17. Activity 20125B, Page 33: Inclear why
18. Activity 20215B, Page 33: Unclear why the cost to disassemble and load 54 ft TBM is less than that shown for 33.5 ft TBM in UCC #2.

5.6 UCC #4B – TBM Double Track Tunnel, 40-ft ID, Slurry Machine in Soft Ground

1. Bid Item 20210 page 1 to Item 20215 page 7

    a. 54 FT TBM shown instead of 40 FT for this UCC. Should adjust purchase price, etc. from a 54-ft TBM to a 40 ft TBM.
    b. Should purchase 42,240 LF of Slurry Pipe. It will wear out and need to be replaced at least once. On the Brightwater Tunnel in Seattle, as an example, the abrasive material wore out pipe, pumps and the TBM Drag Teeth and Gage Ring on the face.

c. No Freight cost in this item. Freight cost is included in TBM Purchase items for other UCCs. Should be consistent.
d. General note for all TBM Bid Items: there is no Plant & Equipment purchases of any equipment or major plant items other than the TBM purchase shown in the estimates. The purchase price for Locomotives, Flat Cars, Mancars, California Switches, Fanline, Utility lines, track, rail, ties, almost everything required to do the work is not shown purchased.
e. Currently, the equipment rates shown appear to be rental rate as there is no purchase salvage plant & equipment sheet. Recommend that this be adjusted to reflect purchase and salvage of all major plant & equipment. A tunnel contractor pricing these tunnels would not be renting the major equipments required to build these tunnels.
f. There is no indication in any of the HeavyBid® Direct Cost Reports stating the number of shifts worked per day. We can only find a 7.5 hour working day with no mention of shifts; this is not typical for tunnel estimates and could be misinterpreted with respect to the production and cost.
g. Typical 3 shift tunnel operation includes Day Shift (work 8 hours pay 8 hours), Swing Shift (work 7.5 Hours pay 8 hours), and Graveyard Shift (work 7 Hours pay 8 hours). This means Work 22.5 Hours Pay for 24 Hours per day. In addition to this the crew gets paid for travel time from the Dry House to the Heading and Back again. The crew also gets paid to work through lunch, they eat of the fly at the heading. There is none of this in any of the estimates that we reviewed.
h. There is no Major Maintenance day such as Saturday for a 5 day work week or Sunday for a 6 day work week or any other method identified as a Major Maintenance day of shift.
i. Items relating to gripper pads and main beams shown. These are not applicable to Slurry TBM.
j. Quantities for invert mud slab are the same as other UCC where 30-ft TBM is used. 40-ft TBM should require different quantities.
k. Item 20215H – drill and blast tunnel service crew shown, which is not applicable to Slurry TBM.

2. Bid Item 20225 page 14.
   a. Locomotives missing (3 Loco Operators included but no Locomotives)
   b. No Walking Boss in Crew
   c. No Shifter in Crew
   d. No Lead Miner in Crew
   e. No Tunnel Travel Time in Item (Have to pay from Dry House to Tunnel Heading & Back plus working through lunch. All this is at O.T. rate)
   f. TBM efficiency hours should use average at 60% of time (Source: various RETC articles relating to TBM utilization from various rock tunnel projects). Operating hours for major equipment should be reduced to 60% of the crew time to match the TBM drive.
   g. Suggest carrying Walking Boss in the Indirect Items (Time Spanned) not in the Direct items as it may be overlooked.
   h. The production for the tunnel drive is shown as 19.54 LF/Day. Page 40 of the Prototypical Tunnel Unit Cost Memorandum shows the average rate at 40 LF/Day. It is

also shown as 40 LF / Day on page 12 in Table 6 under Unit Cost Categories 4B. If the 40 LF/Day is correct, there will be a major cost impact to this bid item.

3. Bid Item 20220, Page 14
    l. Price for 30FTID PCC Segment of $8000 / LF is high. Based on our experience in Seattle for a 56 Foot OD PCC Segment, we received a quote for $5730 / LF. Note also that this Bid Item is for a 40 Foot Slurry TBM not a 30 Foot.

5.7 UCC #8 – D&B Single Track, Twin Tunnel, 30-ft ID in Hard Rock, Support Type IV

1. General note for all Drill & Blast operations:
    a. Unclear why various bolt grade, length and pricing are used.
    b. "Install Resin and Bolt" are shown in crew hours, but no cost listed for resin. Please verify that resin cost was included in unit price for bolts. Resin Cartridges are used for the bolts which I would guess are Dywidag bars.
    c. In every D & B item there is a 4" Submersible Pump for some reason but there is no line item for pipe line or hose for this pump to discharge into.
    d. No fans nor fanline for ventilation in the cost
    e. No tunnel lights, light line, air line or water line listed as well as no track or utilities.
2. General note for the Shotcrete operations:
    a. The crew does not have an Air Compressor listed and the 4" Submersible pump is shown for some reason.
    b. The ST&S amount looks OK as it would cover the 2" Shotcrete hose, extra nozzles, face shield, gloves etc. However, does the concrete quantity in the shotcrete items include a rebound waste factor of 2? If not it should be adjusted for that factor.
3. For mucking out the heading:
    a. There is a Wagner ST3.5 that trams from the face to outside and dumps on the ground. This ST3.5 is too small to load a truck without a ramp as the bucket can't get up high enough to do that. The estimate states the muck is dumped on the ground. There needs to be a loader like a 966 or 988 pick this muck up and load it into the truck. Also need to add a truck spotter and loader operator.
    b. Unclear why the 4" Submersible pump and Burner/Weld Operator are in most all of the bid items, not sure what this person does.
4. Bid Item 30105 Page 56: Clean Tunnel Invert Crew has 2 each Nozzle men and 1 each Burner / Welder. Unclear why these are needed.
5. Bid Item 30105B Page 56 Set & Strip Invert Bulkheads has a Cat 950 Loader, 2 Each Crane Operators but only 1 Crane, 1 Each Burner / Welder, and no Operator for the 950 Loader. Please check.
6. Bid Item 30105 Page 57: Invert Conc. Sngl. Trk. Tnl., unclear why there is a shaft service crew activity
7. Bid Item 30105D Place Tunnel Invert Concrete, unclear why there are a Wagner ST3.5 LHD and a Crane Oiler and Electrician in the crew. There should be Invert Screed in the crew.

8. Bid Item 30105G Service Crew for the invert concrete has a Roadheader Service Crew in this item. This crew includes a 3900 Crawler Crane, a Grove RT 640 E Crane, Oiler, Change House Man and a Top Man. Unclear why these are needed for invert concrete.
9. General Note about the concrete Crews and Activities for this D & B Tunnel. Please review the crew makeup including equipment and personnel and adjust as needed.

5.8 UCC #20 – SEM Single Track, Twin Tunnel, 30-ft ID in Soft Ground, Support Type IV

1. Activity 20200AA, Page 1: the D&SHD1 Crew should be modified to eliminate the Blaster, the Burner Welder and the Powderman. These crew members are not required to drill and install the fore poling rebar.
2. Unclear why all the crews have 4" Submersible Pump in them; what does it do and what does it pump to for discharge.

5.9 UCC #24 – SEM Double Track Tunnel, 40-ft iD in Soft Ground, Support Type IV

1. We like the idea of using Gradall for excavation of this tunnel due to its long reach, attachment to the boom and rotation of the boom; however, we prefer a model with a track instead of rubber tires.
2. For Mucking out heading operations there should be a 966 or 988 FEL and Operator to load the truck for dump disposal. The ST3.5 will not reach high enough to load out a truck without a loading ramp and there is no ramp in the estimate.
3. Unclear why all the crews have 4" Submersible Pump in them; what does it do and what does it pump to for discharge.
4. Activity 20205A4 F & I 9" Shotcrete:
    a. Unclear why the crew has a 953 Track Loader and no Compressor for shotcrete operations.
    b. The shotcrete crew also has a Burner / Welder; unclear what this person does in this crew.
5. Unclear why the Welded Wire crew and the Lattice Girder Crew have a TBM Mechanic in them.
6. Unclear why the Fore Poling crew has a blaster and 2 powdermen in it plus the Burner / Welder.

6.0 UNREVIEWED HEAVYBID® COST REPORTS

Due to the limited time available to conduct the peer review, we were unable to review in detail all tunnel Unit Cost Categories. The general and specific recommendations for HeavyBid® Cost Reports for other tunnel of similar excavation method may serve as a guideline for QA/QC review of these un-reviewed reports:

- D&B Tunnels: please refer to our recommendations for UCC #8
- SEM and RH Tunnels: please refer to our recommendations for UCCs #20 and #24

We did not review the cross passage cost estimates (UCCs #41, #43, #44 and #45) in detail as cross passages represent a small fraction of overall tunnel cost. Nevertheless, based on our experience on similar projects, it is our general opinion that the Unit Price Estimates ($/LF) for cross passages shown in Table 6 of the Prototypical Tunnel Unit Costs Memorandum are in the reasonable range. For 33-ft long by 14 ft ID typical cross passage dimensions, the cost per foot translates to $0.8 to $2.8 millions for cross passage in rock and in soft ground requiring jet grouting for ground improvement, respectively.

Memorandum

ARUP

To	John Hawley, Timothy Fawcett, Michael Witt	**Date**	November 23, 2010
Copies	Neil Carstairs	**Reference number**	
From	Bill Maddex Colm Tully, Amruta Deshpande	**File reference**	
Subject	Peer Review of 15% Design Unit Price Elements	**Page** 1 **of** 6	

PEER REVIEW- UNIT COSTS FOR HIGH SPEED RAIL PROJECT

EXECUTIVE SUMMARY

The analysis below yields a divergence on some significant components of the costs. A cursory view of approximately 75% of the total cost assembly set for trenches and retaining walls could result in significant variance from current market prices (all comparative values are stated in fourth quarter 2010). In general, the overall unit costs/pricing appear to be higher than expected for a project of this enormity.

PURPOSE AND SCOPE

The purpose of this memorandum is to provide a limited peer review of Unit Price Estimates ($/Route Foot and $/Route Mile) for prototypical walls and trenches for the California High Speed Rail Project. Three documents were provided for review:

1. Draft-Unit price estimates - Walls and trenches *(Binder3.pdf)*
2. Prototypical Unit Price Elements *(PrototypicalUPEs(REV2).xlsx)*
3. Unit Price Details Report *(Unit Price Detail_10-01-10.pdf)*

The prototypical unit UPE spreadsheet includes detail on all sections of the cost estimate breakdown but this review has concentrated solely on cost elements in Section C3. Structures – Walls.

UNDERSTANDING OF UNIT COST ESTIMATING APPROACH

It is our understanding that the prototypical unit costs have been prepared by the CHSTP Program management Team (PMT) and will be used in the development of programmatic-level cost estimates and to support future detail cost estimates at a regional level for California High-Speed Train Project.

The walls and trenches unit costs were developed using a commercial cost estimating database software called Timberline. The report has been developed using cost categories as defined by the Federal Transit Administration (FTA) in their Standard Cost Category (SCC) workbook. The industry standard Construction Specification Institute (CSI) MasterFormat 2004 coding structure has been utilized and this coding structure can be used to compare the unit price details report from Timberline with the Prototypical Unit Price spreadsheet.

Some general assumptions and exclusions have been documented in the draft report including:

- UPE's are based on preliminary drawings and quantities
- All costs are in 3rd quarter 2009 dollars
- Typical construction contracting methods will be used and project development costs such as engineering, project or construction management, agency staffing, or project start-up are excluded
- Normal workweek schedule assumed
- Material for general embankment and backfilling assumed to be available from excavated on-site soil
- Temporary support of excavation for cut and cover construction using internally braced solider pile and lagging
- Right-of-Way costs excluded
- Design or construction contingencies excluded
- Financing costs excluded

The direct unit costs have been factored to include mark-up on labor, equipment, material and subcontractor costs as well as state sales tax and contractor profit. The resultant cost is the bid total and is described in the report as *"the bid level unit pricing that would typically be expected utilizing a competitive bid contracting method"*.

APPROACH FOR REVIEW

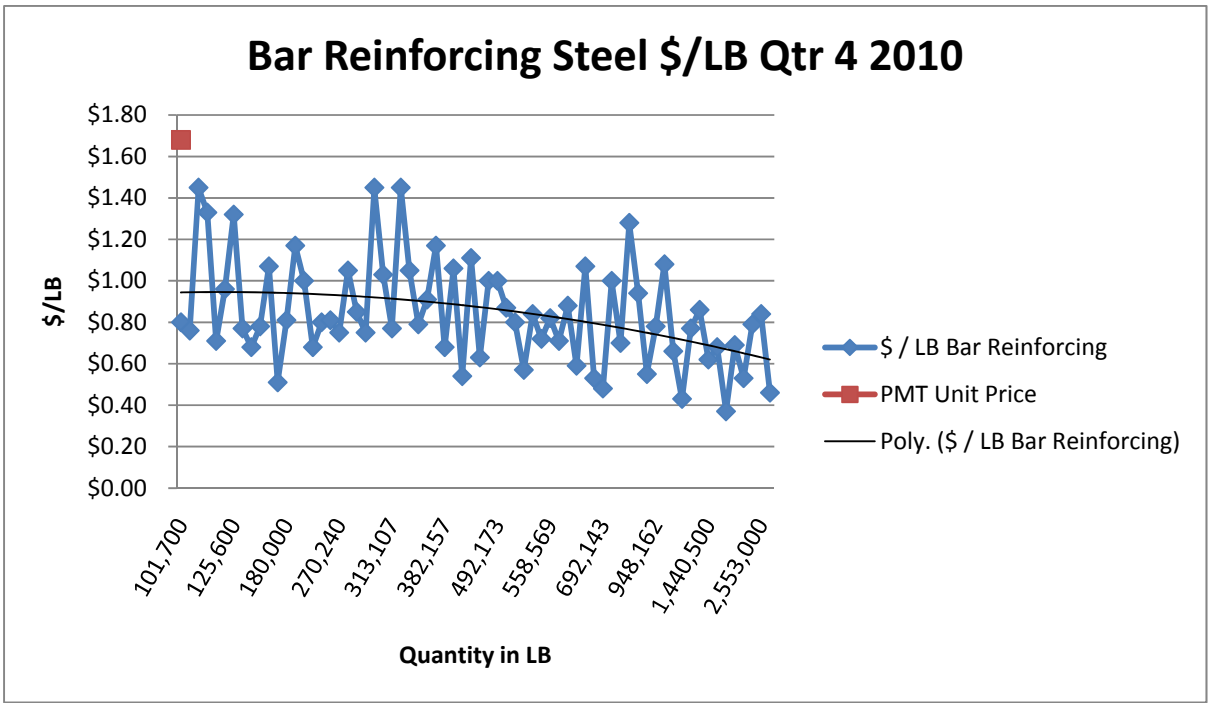
The unit costs from the PMT were analyzed using market analysis, categorical cost model and unit cost data methods. Market analysis was done by plotting unit costs with market trends to find their position in terms of the market trend and scale of economy.

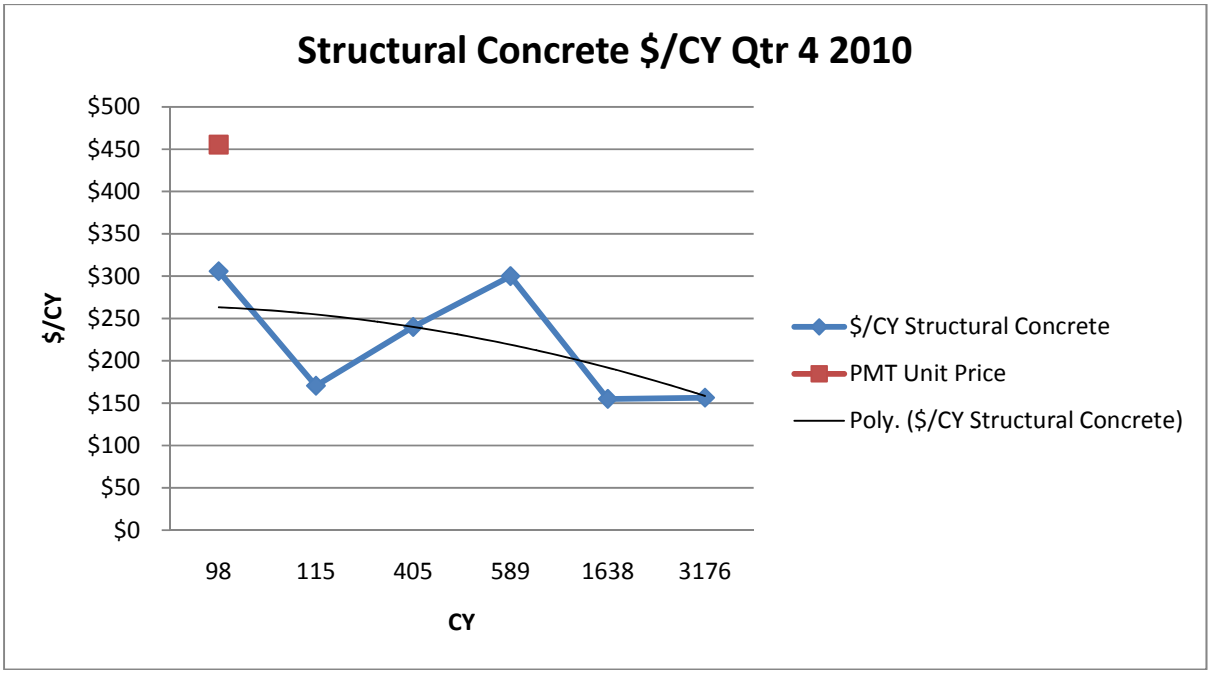
The major sources of reference for review are as follows;

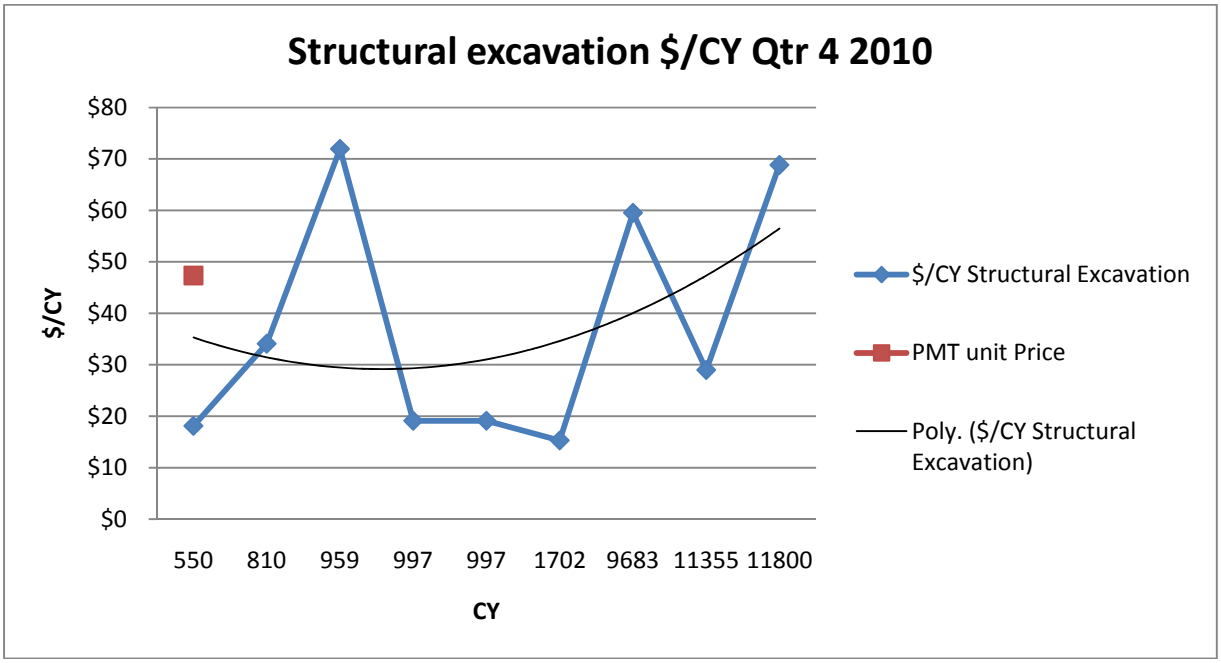
- Caltrans District 8 Cost Data website
- ENR
- Construction E-bid board
- Arup project database
- Heuristics

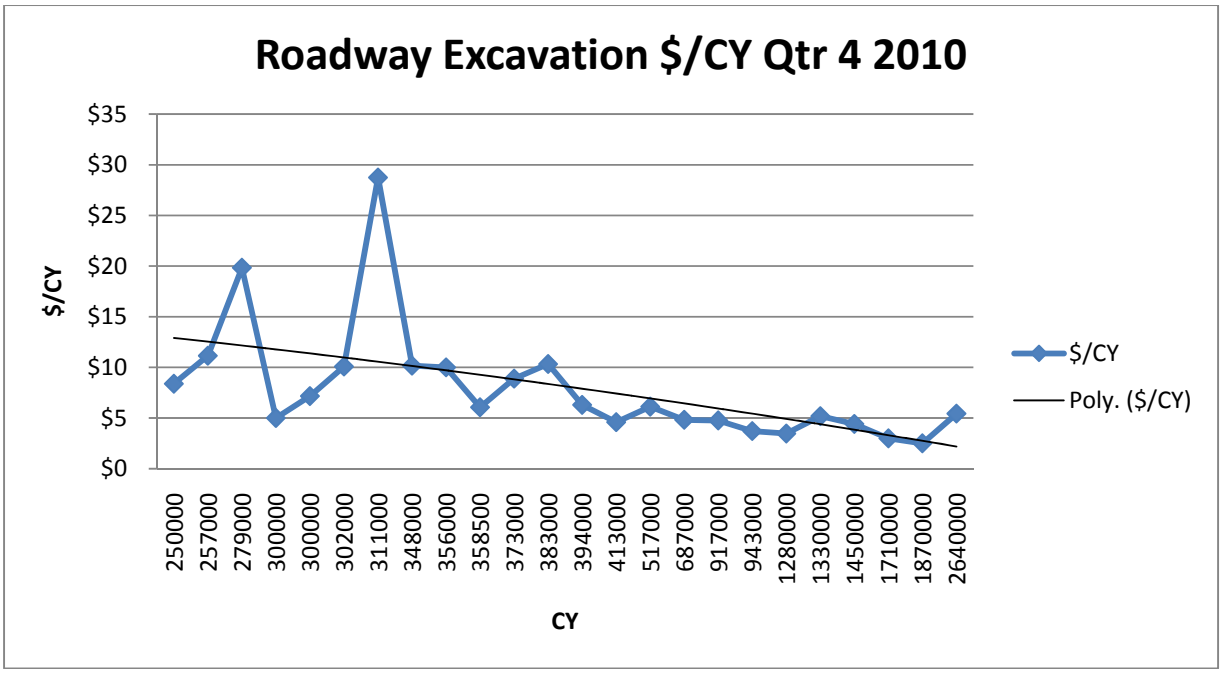
ANALYSIS

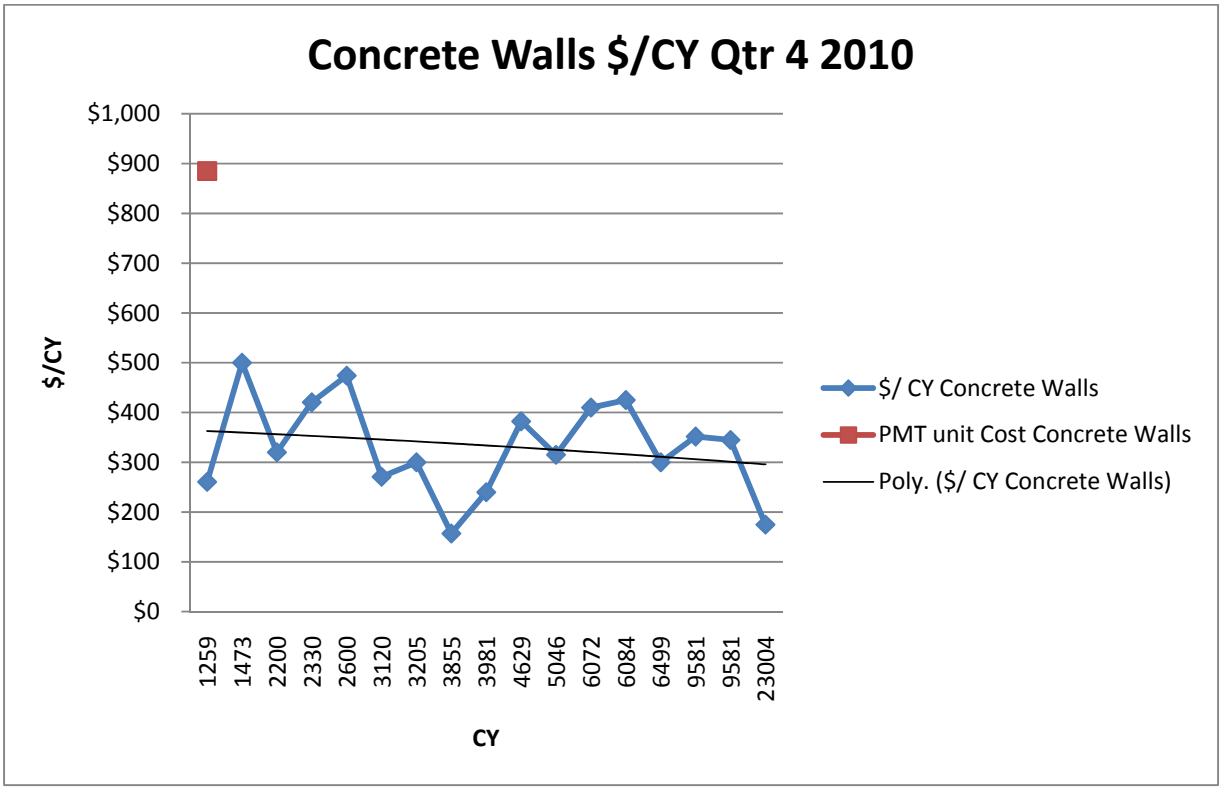
The plots below show some specific significant variance from norms.






Structural excavation $/CY Qtr 4 2010
$80
$70
$60
$50
$40
$30
$20
$10
$0
$/CY
550 810 959 997 997 1702 9683 11355 11800
CY
$/CY Structural Excavation
PMT unit Price
Poly. ($/CY Structural Excavation)


Roadway Excavation $/CY Qtr 4 2010
$35
$30
$25
$20
$15
$10
$5
$0
$/CY
250000 257000 279000 300000 300000 302000 311000 348000 356000 358500 373000 383000 394000 413000 517000 687000 917000 943000 1280000 1330000 1450000 1710000 1870000 2640000
CY
$/CY
Poly. ($/CY)



The figures above show project cost information throughout California from the past four years and have been normalized to 4th quarter 2010. This approach varies from that of the report reviewed and is considered more representative of the project geography. This may vary from what can be seen if only focusing on San Francisco (District 4) or Los Angles (District 7).

The unit prices analysed are documented in the report as being 3rd quarter 2009 dollars. This would be another reason for higher than expected unit costs. The unit price details report is dated 10/01/10. It is assumed that this is the date of printing and that the costs are 3rd quarter 2009 as indicated. Clarification on this issue is requested.

The economies of scale that could be realized due to the significant size of this project may not have been factored into the unit prices under review. Section 6 of the report contains a qualification outlining this issue where it states that the unit prices are *"prototypical"* and that *"there are any number of factors which could affect the applicability to these UPE's to an actual project and the use of this information should be subject to this understanding"*. Although the final economy of scale is indeterminate at this point, it will certainly involve multi-miles of work within a given scope/segment. The data reviewed appeared to focus on much smaller scope/segments than will ultimately be built under any one contract.

Basic parameters such as the bid factor (the total price divided by the direct cost) are outside the norm and lower than expected for a project of this size. The PMT has used a bid factor between 1.25 and 1.3 while the norm for large scale construction projects ranges between 1.5 and 1.7.

CONCLUSION

The variances detailed in the analysis will yield large variances of price/cost when applied to the large quantities of work that are required to build the CHSTP and thus are extremely elastic in nature.

The data supplied reveals a limited view of unit cost build-up and results in a limited review of the unit costs/price. Further examination should be undertaken in order to gain a better understanding of the PMT values represented.

In general, it appears that the overall unit costs/pricing appears to be higher than expected for a project of this enormity.